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PREMATURE SEPARATION OF THE NORMALLY IMPLANTED PLACENTA

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BY this term is understood the separation before the birth of the child of the normally implanted placenta at any time during the last three months of pregnancy. The latter limitation is necessary, as a similar accident may occur before the period of viability is reached, and is one of the important factors in the production of abortion.

The separation may be complete, or may involve only a limited area of the placenta, but in either event blood-vessels are torn through, and bleeding occurs, which is not checked until the uterus is emptied of its contents and is thereby enabled to contract down upon and to compress the bleeding vessels. Since the time of Rigby such hæmorrhage has been designated as accidental, in contradistinction to the unavoidable hæmorrhage which is associated with placenta prævia. According as the fœtal membranes below the placenta become separated or not, the blood escapes through the cervix and thence externally, or is effused between the uterine wall and the placenta and its membranes, and occasionally ruptures through the latter into the amniotic cavity. In the former event the hæmorrhage is external, and in the latter concealed; while in many instances the two varieties are combined, when only a fraction of the effused blood may escape from the vulva.

In this article I shall discuss the subject from two points of view, firstly, in the light of our knowledge up to 1911, and secondly, upon the basis of observations which have been made since that date. In the second section, I shall describe in detail two cases of concealed hæmorrhage which I have recently observed, and shall discuss their bearing upon the etiology, pathology, and treatment of the condition.

History. Hæmorrhage due to premature separation of the normally implanted placenta has doubtless occurred since time immemorial, but its significance has only recently been appreciated. According to Madame Henry, Louise Bourgeois first recognized the condition in 1609, while Baudelocque made a similar claim for Primrose in 1665. Isolated cases were described by Mauriceau, Puzos and other observers during the first half of the 18th century, but it was not until after the appearance in 1776 of Rigby's monograph — "An essay upon the uterine hæmorrhage which precedes the delivery of the full grown fœtus" — that its mode of production was clearly understood. This monograph, which went through five editions — the last appearing in 1811 — exerted great influence throughout the English-speaking world. In it Rigby clearly differentiated between hæmorrhage due to premature separation of the placenta and that

due to placenta prævia, and designated the former as accidental and the latter as unavoidable.

I am unable to accept Holmes' contention that Rigby confused the two conditions, and I agree entirely with Essen-Möller that he is entitled to full credit for their differentiation, and I expect the unprejudiced reader to draw the same conclusion from Rigby's own words: "There is no particular part of the uterus to which Nature seems constantly and uniformly to fix the placenta; it is, nevertheless, for the most part, so situated that if the woman be healthy, and no accident befall her, it does not separate until the full-time of pregnancy, nor then before the entire expulsion of the child; after which it becomes disengaged from the uterus, and is thrown off, making room for its entire contraction, which, shutting up the mouths of the vessels, effectually prevents any considerable loss of blood; for which purpose it is plain it must be fixed to some part of the womb which does not dilate during labor, namely, to the fundus or sides of it. In this case, then, when a flooding comes on before delivery of the child, it is obvious that the separation of the placenta must be due to some accidental circumstance, to violence done to the uterus by blows or falls, or fever, or to some influence of the passions of the mind suddenly excited, such as fear, anger, etc. But from the uncertainty with which, as before observed, Nature fixes the placenta to the uterus, it may happen to be so situated, that when the full term of pregnancy is arrived and labor begins, a flooding necessarily accompanies it, and without the intervention of any of the above accidental circumstances; that is, while it is fixed to that part of the womb which always dilates as labor advances, namely, the collum and os uteri, in which case it is very certain that the placenta cannot, as before described, remain secure until the expulsion of the child, but must of necessity be separated from it in proportion as the uterus opens, and by that means an hæmorrhage must unavoidably be produced."

Similar views were expressed by Denman in 1786 in his "Essay on Uterine Hæmorrhage Depending upon Pregnancy and Parturition." In speaking of bleeding in the last three months of pregnancy, he stated: "These hæmorrhages are occasioned first by the attachment of the placenta over the os uteri; second, by a separation of a part or of the whole placenta which had been attached to any other part of the uterus, etc."

It is also claimed that Burns differentiated the two conditions in his monograph, which appeared in 1807; but, while he had doubtless encountered examples of both, his descriptions lacked the lucidity of those of his predecessors.

Popular interest in this type of hæmorrhage was greatly stimulated by the death in her first confinement of the Princess Charlotte, the only child of George IV, in 1817, and led to numerous casuistic reports. It was also the direct incentive to the preparation of César Baudelocque's "Traité des hémorrhagies internes de l'utérus," which appeared in 1831. This monograph, which was prepared in collaboration with Deneux, was an amplification of an essay which was read before the Société de Médecine de Paris in 1819, and which received the prize offered by Dr. Bousquet just after Princess Charlotte's death. In this verbose production were collected all varieties of hæmorrhage, some of which were undoubtedly due to premature separation of the placenta — notably the report of the post-mortem cæsarean section performed by de laFortrie, in which the completely separated placenta was found loose in the uterine cavity.

Notwithstanding the accumulation of evidence, certain obstetricians still remained skeptical of the possibility of such an occurrence, and Mesdames La Chapelle and Boivin were among the number.

Thirty years passed before another important contribution was made, when Braxton Hicks described a case of concealed hæmorrhage before the London Obstetrical Society in 1861, and collected 22 other cases from the literature. He described the symptomatology and diagnosis with great accuracy and laid down a course of treatment in accordance with the views then in vogue.

Probably the most important article upon the subject was written by Goodell in 1870.

In this he collected 106 cases of concealed accidental hæmorrhage described in the literature, indicated its appalling mortality, and emphasized the impotence of the treatment then available. He also pointed out that the danger did not cease with the delivery of the child, but that many patients succumbed to atonic post-partum hæmorrhage afterward.

The next advance was the suggestion by Weatherly in 1878, and the demonstration by Winter in 1885 of the occasional association of nephritis with the condition — a view which, for a time at least threatened to obscure all further study of its etiology.

In 1892 Storer was able to collect from the literature 153 cases of concealed hæmorrhage, including those of Hicks and Goodell, and reported a successful Porro cæsarean section performed by Bagot of Dublin for the relief of the condition. Two years later Weiss reported a similar operation for the control of atonic hæmorrhage which followed the delivery of the child. These two observations were the forerunners of many others in which radical interference was deemed the most conservative method of coping with this dangerous accident.

Shortly afterward the Rotunda School of Obstetricians headed by Smyly, Macan, and Tweedy, introduced the practice of tightly plugging the vagina as a means of controlling the hæmorrhage and hastening the dilatation of the cervix, and claimed that this method had revolutionized their results.

Finally, Holmes of Chicago in an article which appeared in 1901 proposed that the condition be designated as "ablatio placentæ" in preference to the terms in current use, but the suggestion was not generally adopted. He, however, performed an important service in pointing out that the accident occurred much more frequently than was generally believed, and, instead of being the rare condition described by previous writers, careful study of the patient and the delivered placenta would indicate that it was of comparatively frequent occurrence. He estimated that minor degrees of separation occurred about once in every 200 labors, and attained clinical importance in every five hundred. Time has shown the general correctness of his view, and his only error lay in underestimating the incidence of the accident.

During the following ten years no important additions were made to our knowledge, but the description by Couvelaire in 1911, of the so-called uteroplacental apoplexy introduced an entirely new phase into the subject, which will be considered in detail in the second half of the paper.

Frequency. Although Rigby stated that accidental hæmorrhage occurred quite as frequently as the unavoidable variety, it has generally been assumed that it is of rare incidence, and it is only within the past few years that the correctness of his statements has been recognized. This misapprehension was probably due to the fact that formerly the accident was associated entirely with concealed hæmorrhage, while the lesser degrees of separation with external hæmorrhage were either overlooked or interpreted in some other manner. Thus, the statistics of Herzfeld, Lobenstine and Harrar, and Gaston indicated an incidence of once to every 536, 894, and 1,004 labors respectively.

After Holmes had directed attention to its more common occurrence, other writers adduced statistics in support of his view. Thus, Colclough, Dorman, and Essen-Möller, upon the basis of a large series of obstetrical cases, reported an incidence of one to every 207, 115, and 216 labors, respectively, but they stated that probably one-half of them would have escaped observation except for careful and routine inspection of the placenta; while concealed hæmorrhage occurred in less than one-tenth of these cases.

My own experience is that premature separation of the placenta is a more common factor in the causation of antepartum hæmorrhage than placenta prævia, and in the last 2,000 labors at the Johns Hopkins Hospital, the two complications were noted 17 and 14 times respectively. In all but one instance the accident gave rise to external hæmorrhage, which in 8 patients was so severe as to afford a direct indication for terminating the pregnancy. Absolutely concealed hæmorrhage was not observed in the series; as Case 1, which

will be described later, occurred in private practice. The extent of the separation varied greatly. In Case 2, the placenta lay free in the uterine cavity; in another instance one-half of the placental surface was separated, while in the majority of cases the separation involved areas which varied from 3 by 5 to 5 by 10 cm. in dimension.

Etiology. Up to 1885, when Winter directed attention to the frequent association of nephritis with premature separation of the placenta, the etiological factors most usually invoked were trauma, short umbilical cord, and profound mental emotions. It is interesting to note that in the classical specimen, which is figured in the Atlas of Pinard and Varnier, the accident was attributed to traction upon the placenta by a relatively short cord. From the time of Winter, however, the presence of albumin in the urine has been demonstrated in a considerable proportion of cases, although no clear explanation has been adduced as to its mode of action. Hofmeier considered that nephritis was the cause par excellence, and the accompanying figures indicate the frequency with which albuminuria was noted by the several writers:

Gaston	in 30 out of 70 cases
Bar and Kervily	in 33 out of 58 cases
Dorman	in 82 out of 158 cases
Essen-Möller	in 11 out of 29 cases

Furthermore, the fact that Seitz, Bar and Kervily, Couvelaire, Zarate, and others observed the accident in women suffering from eclampsia, clearly indicates that in certain cases, at least, there must be some definite connection between it and the toxæmic process. Indeed, Bar goes so far as to assume that most of the serious cases are associated with the condition which he has designated as "eclampsisme"— namely, eclampsia without convulsions — and states that it could as readily be held responsible for the retroplacental hæmorrhage as for cerebral apoplexy.

Aschner, who states that albuminuria was observed before labor in 15 per cent of the patients in the Halle clinic, investigated the question by means of Abderhalden's method, and concluded that the albumin was of placental rather than of renal origin. Consequently, he held that such patients were suffering from the "kidney of pregnancy" rather than from nephritis.

Albuminuria was present in 11 and absent from 4 of my 17 patients. Closer investigation, however, deprives the figures of a large part of their significance; as albumin in considerable quantity was present both before and after labor in only two instances. In the other patients it was only present in traces in uncatheterized urine immediately following delivery and promptly disappeared. Consequently, I am forced to conclude that in my cases, at least, the usual forms of toxæmia of pregnancy and nephritis play an inconsiderable, if any, part in the production of the accident. Furthermore, Barchet states that albuminuria was absent in all cases observed in Tübingen, and Guerard holds that it is present only in a small proportion of patients.

While trauma and traction by an absolutely or relatively short umbilical cord may be etiological factors in occasional instances, I am inclined to agree with Zweifel and most recent writers that their importance has been greatly overestimated.

Following nephritis and trauma, most writers consider endometritis and inflammatory and degenerative lesions in the uterine wall as important causative factors, and they are given great prominence in all statistical reports. On the other hand, when the literature is searched for evidence in support of such statements the result is surprisingly meager. Thus, Weiss in 1894 reported finding small-cell infiltration in the decidua and muscularis in several of his cases. Seitz stated that similar conditions obtained in one of his specimens, but were absent from another. Schickele, in addition, described degenerative changes in the decidua which he assumed were connected with the nephritic process and played a part in bringing about the placental separation. But with these exceptions, I have been unable to find positive statements in this regard, and none of the authors have claimed that the lesions were universally present.

On the other hand, in the two specimens which form the basis for this paper, inflam-

matory lesions were not present either in the decidua or muscularis. Moreover, I have examined with the same result microscopic sections, which extended through the entire area of separation, in a number of prematurely separated placentæ. Consequently, I hold that endometritis plays no part in the production of the accident, and that when areas of small-cell infiltration are occasionally found in the decidua, the lesion must be regarded as an accidental complication.

As the result of my investigations and study I am prepared to admit that trauma may occasionally be a causative factor, that I know nothing of the effect of mental emotions, that endometritis, when present, is merely an accidental complication, but that there probably exists some indirect connection between the toxæmic processes and the accident in question.

Symptomatology and diagnosis. Very little need be said under this heading, as this aspect of the subject is well and thoroughly treated in most current textbooks.

I would, however, insist upon the importance of realizing that, while completely concealed hæmorrhage is a very rare complication, antepartum hæmorrhage due to premature separation of the normally implanted placenta is quite as frequent as that due to placenta prævia, and should be diagnosticated whenever the finger introduced past the internal os fails to feel placental tissue. Likewise, that the amount of external hæmorrhage is not necessarily an accurate index of either the degree of separation nor of the quantity of blood lost.

I would furthermore direct attention to the diagnostic significance of the change in the consistency of the uterus; as it has been my experience that whenever that organ presents a ligneous consistency in the latter part of pregnancy or early in labor, and does not alternate between contraction and relaxation, the diagnosis is practically assured. This sign does not depend upon the actual amount of blood lost, and is equally significant whether the hæmorrhage is concealed or external. In the former event, valuable information as to the amount of blood lost may also be obtained by changes in the hæmoglobin content before the pulse gives any indication of the existence of shock.

DESCRIPTION OF CASES AND SPECIMENS

CASE 1. Mrs. E. H. B., private patient, November 27, 1914. A 24-year old nullipara with a normal pelvis. Her previous history was unimportant except for an operation for goiter two years previously. Last period April 17, 1914. Up to the present illness, the pregnancy was perfectly normal, and repeated examination of the urine had shown the absence of albumin and casts.

Without previous warning the patient was seized in the early morning with intense abdominal pain, which she at first attributed to indigestion. When I saw her at 9:30 a.m., she was rolling about the bed and complaining of intense and constant pain. On palpation the uterus was unusually hard and tense, and did not alternate between contraction and relaxation; the fundus was three fingers below the xyphoid. The round ligaments stood out like whip cords. The small child apparently lay in L. O. A., but heart sounds could not be detected. On vaginal examination there were no signs of beginning labor, and the cervix was hard and undilated. No vaginal discharge or hæmorrhage. Notwithstanding a pulse rate of 80 and the absence of shock and pallor, I instinctively suspected the possibility of concealed hæmorrhage due to premature separation of the placenta, and, after giving a hypodermic of morphia, sent the patient to the hospital for observation.

Upon admission at 11:30 a.m., the hæmoglobin content was found to be 55 per cent, but the general condition had slightly improved, probably as the result of the morphia. At 2 p.m. the patient looked pallid and sicker than before. The pulse was unchanged, but the hæmoglobin had fallen to 35 per cent, and the uterus was ligneous in consistency and apparently slightly larger than in the morning. There was still no external bleeding. A positive diagnosis of concealed hæmorrhage was then made, and in view of the undilated condition of the cervix it was determined that the most conservative method of delivery would be by cæsarean section.

The usual preparations were made, and by the time the patient was ready for operation the pulse had risen to 160. Following the administration of two barrels of ergotol, the abdomen was opened in the midline. Upon incising the uterus, a stream of clear amniotic fluid escaped under great pressure, and for a moment led me to fear that I had made a mistake in diagnosis. The freshly dead seven months child was extracted by the feet and immediately thereafter the completely detached placenta came into the uterine wound, and upon removing it a large amount of fluid and coagulated blood escaped, which I estimated at 1½ to 2 litres.

The uterus was then eviscerated and was found to present a very striking appearance, the whole right side being dark purplish red in color, and

resembled an ovarian tumor with a twisted pedicle. The median end of the right broad ligament was considerably swollen and presented a similar appearance, which also involved the lateral two-thirds of the tube. The ovary appeared to be normal; and the corpus luteum was situated on the opposite side. Following its evacuation, the uterus showed no tendency to contract and had the consistency of a piece of moist leather. There was, however, comparatively little hæmorrhage.

In view of the fact that the patient was a primipara, I hesitated about removing the organ and gave 2 ccm. of pituitrin hypodermatically and attempted to stimulate contractions by means of external hot applications and by rubbing its interior with iodoform gauze. As this was without effect, I reluctantly decided to remove the uterus. It was amputated without difficulty at the level of the internal os, the tubes and ovaries being left *in situ*. After covering the stump with peritoneum, the abdominal wound was closed in three layers.

At the completion of the operation the patient was less shocked than might have been expected, but during the following days she improved less rapidly than was anticipated, the pulse remaining high and the pallor continuing, notwithstanding the fact that she received large amounts of saline per rectum and took food readily. On the evening of the fifth day the pulse became weaker and more rapid, and the pallor increased, the hæmoglobin remaining at 35 per cent. As there were no signs of hæmorrhage, it was felt that the blood-making function was in abeyance and that transfusion might be of benefit. Accordingly, after the usual hæmolytic tests, she was infused directly from her brother. This was followed by a slight temporary rise in blood pressure and a brightening of the mucous membranes and face, but twelve hours later the patient's condition was essentially the same, so that it was doubtful whether she derived any benefit from the transfusion. She gradually improved, however, and left the hospital three weeks after the operation with a hæmoglobin percentage of 55 and the pulse in the neighborhood of 120. Three weeks later I saw the patient at her home and found her greatly improved, but somewhat pallid, while the pulse was still rapid; so that the question arose as to whether the tachycardia should not be attributed to hyperthyroidism.

Description of specimen. The uterus and placenta were placed in formalin immediately after the operation, and when examined the next day presented the following appearance: Placenta 18 x 15 x 2 cm. in its various diameters; no white or red infarcts; maternal and fœtal surfaces normal except for a pronounced marginata. No coagulated blood was adherent to its maternal surface to indicate its premature separation.

The uterus, which was unusually flabby, measured 15 x 12 x 5 cm. in its various diameters, with a large cut surface corresponding to the lower uterine segment and an incision in the center of its anterior wall. Its posterior surface and both margins, but particularly the right, presented a bluish, purplish coloration apparently due to the effusion of blood. A horizontal section was then cut just beneath the insertion of the tubes, when it was found that the placental site occupied the posterior wall, which measured 2 cm. and the anterior wall 1.75 cm. in thickness. The most striking feature was that three quarters of the section presented a bluish, purplish appearance, due to the extravasation of blood between the muscle-fibers. This was most marked on the right side, but the only portion which was free from it was the left half of the anterior wall. Figs. 1 and 2, give an excellent idea of the contrast between the conditions present in the specimen and in a normal puerperal uterus.

Microscopic sections through the placenta showed perfectly normal conditions, although the villi were slightly larger than usual, and had a very cellular stroma. There were no changes suggestive of syphilis; the maternal surface was normal except for a number of small hæmorrhagic areas in the decidua and showed no sign of leucocytic infiltration.

Sections through the uterine wall at various levels presented practically identical conditions. The remnants of the decidua vera were normal and showed no trace of inflammation. At the placental site there was an unusual amount of fibrin, and just beneath the decidua basalis large quantities of blood lay free between the muscle-fibers. In all sections the most striking feature was the existence of profuse hæmorrhage throughout the muscularis, particularly in the posterior wall and right margin. In places the blood had entirely disassociated the muscle-fibers, thereby explaining why the organ had failed to contract at the time of operation (Fig. 4).

The large veins were uniformly empty, but in the walls of many free hæmorrhage had occurred, just beneath the endothelium, and communicated freely with the hæmorrhagic effusions between the muscle-fibers. Many of the smaller veins were filled by fresh thrombi. The arteries were in great part normal, but a number presented peculiar degenerative changes. In some of the smaller ones the intima was swollen in places and projected into the lumen, and was conspicuous on account of the diffuse blue staining which it assumed. In such areas the finer architecture of the vessel-wall was disturbed, and peculiar defects were seen which appeared as clear circular or elliptical zones, while in other places irregular blue granules were found which stained very intensely with hæmotoxylin. Throughout these areas nuclear fragmentation and atypical arrangement of the cells was observed (Fig. 5). In several places defects were present in the intima of the larger arterioles, which may have been connected with the hæmorrhagic areas in their vicinity. After finding these arterial changes, the entire right half of the uterus was cut into serial sections for the purpose of determining whether

similar lesions existed in the main branches of the uterine artery, but the results were negative. Specimens stained by Weigert's method showed no increase in the amount of elastic tissue.

Diagnosis. Premature separation of the normally implanted placenta, concealed hæmorrhage, hæmorrhagic infarction of the uterus, degenerative arterial changes.

CASE 2. A. F., No. 7,190. The eighteen-year nulliparous patient was seen in the dispensary April 13, 1915, when examination showed that she was nine months pregnant; child in R. O. A.; pelvis normal. There was some œdema of the feet and a definite amount of albumin in the urine, but no other signs of toxæmia; blood pressure 120. On three other occasions during the following two weeks the urine was examined but was found negative.

On May 4, the patient was brought to the hospital in the ambulance, and gave the following history: Labor pains had begun the evening before and at about 6 a.m. a gush of blood had occurred from the vagina. She was seen by the out-patient department about noon and was brought at once to the hospital. On admission at 1:20 p.m. a considerable amount of dark red blood was escaping from the vagina. The patient was extremely pale; pulse 128; blood pressure 100; temperature normal, and hæmoglobin 32 per cent. The uterus reached to within two fingers' breadth of the xyphoid and was so hard and boardlike that the child could not be palpated, although the head seemed to be engaged. Fœtal heart sounds could not be heard. On vaginal examination the outlet was nulliparous, external os admitted one finger, cervical canal intact; placental tissue not felt.

In view of the shock, which was out of proportion to the amount of blood lost, the consistency of the uterus, and the absence of placenta prævia, the Resident Obstetrician made a diagnosis of premature separation of placenta with concealed and external hæmorrhage, and notified me. I decided that cæsarean section would be the most conservative method of delivery, and operated as soon as the necessary preparations were completed. When abdomen was opened, its cavity was found to contain a quantity of clear serous fluid. Upon incising the uterus a stream of amniotic fluid escaped with considerable force. The dead child which presented in R. O. T., was extracted by the feet. Immediately following its delivery the placenta appeared in the wound, and as it was extracted a large amount of partially clotted blood escaped with it. Notwithstanding the fact that considerable quantities were lost, 900 ccm. were collected and measured.

Upon eviscerating the uterus, it was found that it showed no tendency to contract and presented the consistency of a wet leathery sac, notwithstanding the administration of 1 ccm. of pituitrin and a barrel of ergotol at the beginning of the operation. The upper part of the body of the uterus presented a peculiar purplish, bluish, coppery appearance similar to that observed in Case 1; the right tube and ovary were reddish black in color and suggested the conditions observed in an ovarian cyst with a twisted pedicle. The right broad ligament was distended by blood and formed a hæmatoma of considerable size, while the left tube and ovary were normal. As the uterus did not contract in spite of energetic massage, supravaginal hysterectomy was done, the right appendages being removed and the left retained *in situ*. The amputation was done through the lower part of the lower segment and the stump covered with peritoneum in the usual manner. As we were particularly impressed by the size of the ovarian vessels, a separate ligature was placed on each of the main vessels in addition to the original ligature. The abdominal wall was closed in four layers. Very little blood was lost and the patient was returned to bed in approximately as good condition as before the operation. A subcutaneous mammary infusion was started while she was still on the table. The child was slightly macerated, weighed 3,190 grams, and measured 52 cm. in length.

When the patient was returned to bed, coffee and salt solution were given per rectum, and her condition seemed quite satisfactory. Three hours later, however, the vulval pads were tinged with blood and the pulse had risen to 142. The vagina was accordingly packed with gauze and no further bleeding occurred. The patient's condition continued serious throughout the night but had considerably improved the next morning, when the pulse was 130, blood pressure 135 and hæmoglobin 16 per cent. The improvement continued, and by the fourth day the pulse had fallen to 100.

Following this there was some elevation of temperature, and a mass slowly developed in the right lower quadrant of the abdomen. Blood cultures were negative. By June 1 a definite tumor had formed, which filled out the right lower abdomen and extended to the left of the midline; while on vaginal examination a fluctuant mass was felt in the right broad ligament and bulged behind the cervix. The vaginal mass was punctured, and the abdominal tumor opened extraperitoneally by an incision above and parallel to Poupart's ligament, when a large quantity of greenish pus escaped. The wounds were packed with gauze and the necessary sutures introduced. Bacteriological examination showed staphylococci and an unidentified Gram positive bacillus. Following the operation the patient improved rapidly, and at the end of a month was discharged in excellent condition with a hæmoglobin content of 60 per cent.

A catheterized specimen of urine obtained at the time of the cæsarean section contained 2 grams of albumin per litre, and numerous granular casts. This rapidly diminished, but traces were still present at the time of discharge, making it probable that the patient is suffering from chronic nephritis.

Description of specimens. The placenta measured 21 x 19 x 1.5 cm., presented a few small white infarcts on its fœtal, but none on its maternal, surface.

Microscopic sections showed normal conditions. The decidua basalis contained many chorionic cells but showed no sign of inflammation. In places the decidual cells were pushed apart by small collections of blood, which probably played a part in bringing about the separation.

Immediately after the operation, a water-color sketch of the specimen was prepared under the supervision of Mr. Max Broedel, and shows very clearly the striking appearance of the uterus and its appendages (Fig. 3, see frontispiece). The uterus was unusually large and flabby, and measured 19 x 14 x 5.5 cm. in its various diameters. Except for the lower two thirds of the midline of both the anterior and posterior walls, its exterior presented a peculiar, mottled bluish, purplish, coppery appearance, with many distended venous vessels. The non-affected central portion presented the characteristic appearance of a normal fresh puerperal uterus. The placental site was on the posterior wall.

The tube measured 13 x 0.3 x 0.5 cm. The fimbriated end was free, but was bluish black in color, suggesting infiltration with blood. The ovary measured 4.5 x 2 x 1.5 cm. in its various diameters; it was free from adhesions, but presented a generally apoplectic appearance, as in a case of twisted pedicle. No follicles were visible on its exterior.

Sections for microscopic examination were cut through various portions of the uterine wall, as well as from the tube and ovary. Those from the anterior wall just below the fundus showed that the hæmorrhage was in great part limited to the outer half of the organ. Here it had spread apart the individual muscle-fibers and bands, just as in Case 1, and in places was associated with very considerable œdema. Apparently it was not connected with the larger vessels, which, in many places had been dissected out by the hæmorrhage. Sections through the placental site show similar hæmorrhagic changes in the muscle wall, but the decidua and serotina were perfectly normal, except for small hæmorrhagic areas and showed no sign of inflammatory change. In this region many of the larger veins were almost completely filled by large thrombi, which were made up of platelets and leucocytes, but contained very little fibrin. Many of the smaller veins were almost occluded by white thrombi of the same character. The large arteries were normal, but certain of the smaller ones presented changes in the intima similar to those observed in Case 1. The endothelium was unchanged, but the tissue beneath it was increased in thickness, took on a peculiar bluish color with hæmotoxylin and suggested a mucoid change. Here and there it contained peculiarly shaped refractile bodies similar to those described in Case 1. Sections from the various portions of the main uterine and ovarian vessels showed normal conditions.

Sections through the tube showed a normal mucosa. In its lateral portion the muscle-fibers were widely spread apart by hæmorrhage. Sections through the ovary showed numerous primordial, but very few maturing follicles. Free hæmorrhage had occurred throughout the stroma of the organ, widely separating its component parts. In places primordial follicles lay apparently free in the midst of hæmorrhagic areas, and many of the larger vessels were completely isolated. The vessels themselves were normal.

Diagnosis. Premature separation of the normally implanted placenta, with combined concealed and external hæmorrhage. Hæmorrhagic infarction of the uterus, right tube, and ovary. Extensive thrombosis; peculiar degenerative arterial changes.

DISCUSSION OF CASES AND SPECIMENS

When I had completed the histological study of my first specimen. I thought that I had made a unique observation; but, upon looking through the literature I discovered that such was not the case, and that similar conditions had already been described.

In 1911 Couvelaire reported to the Obstetrical Society of France the history of an albuminuric patient upon whom he had performed cæsarean section on account of premature separation of the placenta. After emptying the uterus he was surprised by its peculiar appearance, which resembled that of an ovarian tumor with a twisted pedicle, and, as the uterus failed to contract, he removed it by supravaginal amputation. Macroscopically, the specimen was identical with those which I have just described, and the drawings showed that the histological lesions were of the same character, except that vascular changes were absent. He designated the condition as "apoplexie utéro-placentaire," and was inclined to regard it as a manifestation of the toxæmia of pregnancy. The following year he reported two additional cases, in one of which the uterus was removed at autopsy after the patient had died from eclampsia, and was reproduced in colors in volume ix of the *Annales de Gynécologie.*

Following his publications, similar cases were reported from all parts of the world, so that I have been able to collect 20 which have been recorded during the past four years, namely: 3 cases each by Couvelaire and Essen-Möller, 2 cases by Zarate, and one case each by Fabre and Bourret, Fieux, Zweifel, Berggren, Spaeth, Jettner, Fraipont, Clifford,

Fig. 1. Horizontal section through normal fresh puerperal uterus. Hardened in formalin.

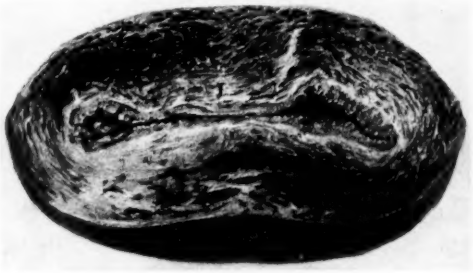

Fig. 2. Horizontal section through uterus removed on account of premature separation of placenta. Hardened in formalin.

King, Young, Brandt, and Shaw. A number of these were mentioned quite incidentally, but others were accompanied by careful descriptions of the anatomical and histological findings; while the specimens of Zweifel and Zarate were reproduced in colored plates.

It is evident that this enumeration is not exhaustive, for Young stated that he had seen five such specimens, and Shaw remarked that he had observed intramuscular hæmorrhage in four out of five uteri, which had been removed for the relief of accidental hæmorrhage. Moreover, upon searching the literature, I found that a number of cases had been observed prior to Couvelaire's publication, but that great significance had not been attached to the condition of the uterus, which was usually casually mentioned. In this category belong cases observed by Desmond, Weiss, Knauer, Seitz, Targett, LeLorier, Bar and Kervily, Keyworth and Monro-Kerr. It is interesting to note that in Knauer's case the autopsy had been done by Kolisko, who described the condition as hæmorrhagic infarction of the uterus.

From the evidence which I have adduced and from the description of my two specimens, it is apparent that the condition described is a frequent accompaniment of premature separation of the placenta, and may occur in patients presenting either concealed or external hæmorrhage, and in whom labor has ended spontaneously or has not yet begun. It would be assuming too much to assert that it is a universal accompaniment of the accident, but the fact that it has been observed so frequently during the past few years justifies the belief that it is of common occurrence; and now that attention has been directed to it that it will be noted very frequently at operation or autopsy. In any event it is a very striking and characteristic lesion, which in the first place affords a satisfactory explanation for certain clinical manifestations, and in the second place indicates that the more serious cases of premature separation of the placenta are not due to mere local causes, but are manifestations of conditions originating outside of the generative tract.

It is also important to note that the hæmorrhagic lesion is not limited to the uterus, but may involve the tubes, ovaries, or broad ligaments, as well. In Couvelaire's first case both broad ligaments were involved, while in each of mine the right broad ligament was swollen and so congested as to be almost black in color, and similar findings have been recorded by other observers. Furthermore, the tubes and ovaries may also be involved, as in my second case, and in one recorded by Keyworth.

Occasionally large quantities of blood are found in the peritoneal cavity. In most instances it apparently comes from fissures upon the surface of the uterus or broad ligaments, but exceptionally, as in the case of Keyworth, its origin was not evident.

These fissures are more or less parallel to the long axis of the organ, rarely more than a few centimeters long, and usually extend only a slight distance into the muscularis. They have been noted by many writers,

notably by Hicks, Weiss, Knauer, Kouwer, Engström, Zweifel, Lieven, Shaw, and Fraipont, and were studied particularly by Knauer and Fraipont. The former believed that they resulted from the extreme distention of the uterus by the concealed hæmorrhage, but the latter contends that they are attributable to the rupture of distended vessels just beneath the peritoneal surface. Fraipont also directs attention to the fact that their existence has long been recognized, and states that Duparque in his monograph referred to a number of early cases. The practical significance of such lesions will be discussed later.

As has already been indicated Couvelaire designated the uterine lesion as uteroplacental apoplexy — a term which had been applied by Jacquemier to the hæmorrhage between the uterine wall and placenta; while Kolisko described it as a hæmorrhagic infarction. To my mind, neither term correctly describes the condition, but I am not prepared to suggest a better one.

When it is attempted to ascertain the significance of the lesions and the manner in which they are brought about, definite statements cannot be made, and for the present we must be content with theoretical generalizations. In the first place, the hæmorrhagic lesions afford a satisfactory explanation for the first stages in the separation of the placenta; as it is only necessary for minute hæmorrhagic areas in the decidua basalis to coalesce in order to inaugurate the process, which, once begun, will continue and be stimulated by the enclosed collection of blood acting as a foreign body. In the second place, it is justifiable to assume that the tension of the uterine wall resulting from intramuscular hæmorrhage, and the consequent disassociation of the muscle-fibers, may be a factor in producing a degree of shock out of proportion to the amount of blood effused into the uterine cavity or lost externally. Again the changes in the uterine wall afford a very satisfactory explanation for the imperfect contraction of the organ, and render it apparent why in the past so many women perished from atonic hæmorrhage after the completion of labor. And finally, the vertical fissures upon the exterior of the uterus indicate a rational origin for the intraperitoneal hæmorrhage, which sometimes complicates the condition, and renders it clear why patients occasionally succumb after a uterine hæmorrhage which could ordinarily be borne with impunity.

On the other hand, it is far more difficult to explain the mechanism by which the hæmorrhage occurs and its ultimate cause. I have already described the arterial changes observed in my specimens, and have stated that lesions of continuity were noted in some of the smallest arterioles, which would explain the escape of blood into the surrounding tissues. Most observers do not mention the condition of the vessels, or state that they were normal. Couvelaire could find no arterial changes, but stated that lesions of continuity were present in the veins, which would readily account for the intramuscular hæmorrhage. Young, on the other hand, detected no vascular lesions in the uterus, but found that the left ovarian vein was completely thrombosed, and explained the hæmorrhagic changes on the basis of obstructed circulation. In my two specimens, however, the large vessels were normal.

Accordingly, it is apparent that the evidence at present available is too scanty and contradictory to admit of definite conclusions concerning the mode of production of the hæmorrhage, but, as in many instances similar lesions were present in the broad ligaments, tubes, and ovaries, it would appear plausible to assume that the factor concerned did not act exclusively upon the uterus, and in all probability came from beyond the generative tract.

The fact that arterial changes were present in both of my specimens renders it improbable that I had to do with mere accidental findings, and makes pertinent the query as to whether more careful search might not have revealed their presence in other cases. Time only can answer. But assuming that similar changes are found, what influence could they have upon our conception of the entire process? Careful study of the arterial lesions in my specimens has led me to believe that they are toxic in origin, and are due to the action of some substance circulating in the blood,

which possibly also produces changes in the smallest arterioles and capillaries which permit the escape of blood into the tissues, just as is observed in certain varieties of snake poisoning.

I am perfectly well aware that this is pure speculation, and, even if proved, that it would only bring us one step nearer the ultimate cause. Somewhat similar views have already been expressed by Bar, Couvelaire, Essen-Möller, and others, who believe that the entire process is in some way connected with the ordinary toxæmia of pregnancy and eclampsia, and, in the section on etiology I have referred to its supposed connection with those conditions. If such a connection could be proved for all cases, the evidence would be incontrovertible, but such is not the case; as many examples of premature separation can be adduced in which the urine is normal, at least so far as the ordinary tests are concerned. Furthermore, arterial changes, such as I have described, have not been observed in the uteri of women who have died from nephritis or eclampsia.

One of my two patients, upon whose cases this article is based, presented albuminuria and probably nephritis, while in the other the urine was normal both before and after the accident; yet both presented identical uterine lesions with striking arterial changes. If the lesions in the first case were due to nephritis, to what were they attributable in the second? We do not know; but for the present at least, I prefer to believe that they were both due to some common cause, which I assume to be "toxæmic" in character, but distinct from the usual toxæmia of pregnancy, and concerning the nature and origin of which I am ignorant.

Treatment. The important conclusions which can thus far be drawn from our studies are: (1) That premature separation of the normally implanted placenta occurs much more frequently than is generally believed and may give rise to only trifling clinical symptoms or may put the life of the patient in the greatest jeopardy. (2) That in the severe cases, at least, the accident is associated with profound disorganization of the uterine muscle by hæmorrhage, the so-called utero-placental apoplexy. And (3) that its causation is probably dependent upon some as yet undifferentiated form of toxæmia, which may or may not be accompanied by albuminuria.

Fig. 4. Section showing disassociation of uterine muscle by hæmorrhage. Light areas indicate muscle; dark, blood.

What deductions can be made from these conclusions for the guidance of the practitioner at the bedside? In the first place, it is important to remember that external hæmorrhage due to premature separation of the normally implanted placenta is relatively common, while concealed hæmorrhage is rare. Accordingly, the possibility of the accident should always be considered when dealing with antepartum hæmorrhage, and a tentative diagnosis should be made unless the existence of placenta prævia can be positively demonstrated. Furthermore, a diagnosis of concealed hæmorrhage should be made whenever a patient in the later months of pregnancy complains of intense abdominal pain, is pallid, and presents a uterus of ligneous

consistency, in the absence of external bleeding and even of the clinical symptoms of shock.

The second important deduction is that hard and fast rules cannot be laid down for the treatment of premature separation of the placenta; but at the same time it should be regarded as axiomatic that even in slight degrees of separation the bleeding will continue until the uterus has been emptied of its contents, and is able to contract down upon and constrict the bleeding vessels. This, however, does not mean that the uterus should be emptied artificially in all cases of accidental hæmorrhage, as in many instances excellent results are obtained by expectant treatment. Thus, of the 17 cases which I have recently observed, 9 terminated spontaneously without special treatment, while 8 were ended artificially in the interests of the patients. All of the mothers, and 40 per cent of the children were discharged in good condition.

In general, the decision to interfere will depend upon the amount of blood lost and the general condition of the patient. If the hæmorrhage is slight, and is not associated with untoward symptoms, the case will usually terminate successfully by the unaided efforts of Nature; although it is understood that the patient should be watched carefully and interference resorted to upon the first appearance of serious symptoms.

On the other hand, if the bleeding is profuse and the condition of the patient serious, prompt intervention is necessary, when the choice of operation will depend upon the condition of the cervix—forceps, version, the introduction of Champetier de Ribes' balloon, or cæsarean section being employed, according to the exigencies of the case. The latter operation should be chosen only when the cervix is but slightly dilated, or when the general condition of the patient is more serious than can be accounted for by the amount of blood which has escaped. In this event the condition is probably complicated by concealed uterine or intraperitoneal bleeding. In such circumstances, abdominal is preferable to vaginal cæsarean section, as it makes it possible to inspect the uterus carefully and to preserve or remove it as may seem expedient.

Moreover, it should be remembered that all danger has not passed with the delivery of the child through the maternal passages, whether spontaneously or artificially; as the uterus frequently fails to contract satisfactorily, and death from atonic hæmorrhage may result, unless radical measures are taken for its relief. Accordingly, when such an accident supervenes, time should not be wasted in employing hot intra-uterine douches, ergot, or pituitrin and similar measures, but the uterus should be immediately packed with gauze. If this leads to forcible contractions and completely checks the bleeding, well and good; but if blood-tinged serum makes its way through the pack the abdomen should be immediately opened and the uterus removed *in toto*, or amputated supravaginally, according to the predilections of the operator. Zweifel has reported that three such operations were necessary in the last 22 cases of external accidental hæmorrhage which he treated.

In times past such a recommendation would have seemed to represent the height of radicalism, but, now that we are acquainted with the hæmorrhagic lesion of the uterus, operative interference is clearly indicated, as in such cases the organ is so damaged by intramuscular hæmorrhage that it is unable to contract and retract satisfactorily, so that its retention is practically synonymous with death from atonic hæmorrhage.

Again, even though the empty uterus may have apparently contracted and retracted satisfactorily and there be no external hæmorrhage, the patient may pass into a condition of shock, or be depressed out of proportion to the amount of blood lost. In such circumstances one should always consider the possibility of intra-abdominal bleeding from the superficial fissures which so often develop upon the peritoneal surface of the uterus; when, even though the physical signs indicative of free blood in the peritoneal cavity cannot be elicited, the abdomen should be opened. If hæmorrhage has occurred, the uterus should be removed; but if a mistake in diagnosis has been made, no great harm

will be done the patient, and the obstetrician will experience a feeling of security which he could gain in no other way.

It will be noticed that I have said nothing concerning the advisability of rupturing the membranes or of "plugging" the vagina, in case the cervix is not sufficiently dilated to permit prompt delivery. I have done so deliberately, since they are not needed in the milder cases, while in the severe ones they cause the physician to delay in resorting to the radical measures which are essential to the salvation of the patient.

The indications for treatment are even simpler when a diagnosis of concealed accidental hæmorrhage has been made. In this event cæsarean section is the operation of choice, except in the rare cases in which the cervix is fully dilated when the patient is first seen, when the child should be promptly delivered by the appropriate obstetrical procedure. But under all other conditions, I am convinced that immediate abdominal cæsarean section will be the most conservative procedure for the mother, and the only one which offers the slightest chance for the child.

For many years the more radical obstetricians have urged it as the simplest means of emptying the uterus and enabling it to check the hæmorrhage by its contraction; but the recognition that the problem is not so simple, and that the peculiar danger of the condition lies in the disorganization of the muscular wall of the uterus by the hæmorrhage, which has deprived it of the power of contraction, makes the conservative obstetrician advocate cæsarean section as the ideal method of procedure and the only one which gives reasonable promise of insuring the life of the patient. I am confident that the two women, whose histories form the basis for this paper, owe their lives to my decision, and that no one who has seen or felt the atonic, infarcted uterus, which seems to characterize this condition, would ever again be willing to take the chance that it would contract satisfactorily after the completion of labor. This does not necessarily mean that the uterus should always be removed; for it should be retained if it has not been too damaged to fulfil its immediate function of controlling hæmorrhage by contraction and retraction.

Fig. 5. Section showing degenerative arterial changes.

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WHAT HAS THE AMERICAN GYNECOLOGICAL SOCIETY DONE FOR GYNECOLOGY[1]

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At our last annual meeting, our president, J. Whitridge Williams, gave a valuable and interesting address entitled, "Has the American Gynecological Society Done Its Part in the Advancement of Obstetrical Knowledge?" With the idea of continuing the study of the work that the Society has done, supplementary to Dr. Williams' address, I have selected as my subject, "What Has the American Gynecological Society Done for Gynecology?"

All of the presidential addresses have been read, and all papers and discussions of gynecological subjects have been reviewed. The task of conscientiously reading the above in all of our thirty-nine volumes of transactions has been arduous, yet interesting, and I feel well repaid for the time expended. Six hundred eighty-three papers have been presented upon gynecological subjects, not including ectopic pregnancy, by one hundred ninety authors.

The work of Thomas Addis Emmet. The first paper read before our society was by Thomas Addis Emmet. The great value of his contributions induces me to believe that it would be interesting to refer briefly to them. He gave a presidential address, contributed eleven papers, and took an active part in discussions throughout the early history of the society. His chief contributions were upon uterine displacements, vesicovaginal fistulæ, perineorrhaphy, and trachelorrhaphy. His first paper upon uterine displacements contained a statistical study of 2,447 cases. The clinical histories which he kept and the observations which he recorded to obtain the information contained in this paper would even now be models for imitation. The value of this work as an incentive to others to do accurate, scientific, clinical work is beyond estimation. A second paper on uterine displacements is notable for the statement: "The degree of prolapse below, or the elevation of the uterus above, a certain plane causes the symptoms now usually attributed to version alone." This plane he named the "health line." This paper was, in many respects, years in advance of the general knowledge of uterine displacements, as the profession has only of late appreciated the fact that prolapse is the only uncomplicated uterine displacement that is of any pathologic importance.

The observations and deductions of Emmet, given in his paper on the etiology of vesicovaginal fistulæ, settled for all time that the obstetric forceps are not the cause of fistulæ; that fistulæ usually result from neglected impaction of the fœtal head in the pelvis.

Emmet's contribution on laceration of the perineum was a milestone in the development of gynecology. He found that the perineal body was not a "wedge support" to the pelvic organs, and established the fact that the strength of the perineum as a pelvic support depends upon the integrity of the levator ani muscle and its fascia. Little has been added to his pathology of laceration of the perineum; the technique of repair of injuries to the levator ani muscle and its fascia has been improved. Emmet's contribution on laceration of the cervix eliminated "ulcer of the cervix" from textbooks. He appreciated and often remarked that "trachelorrhaphy is a much-abused operation."

It pleases me greatly that I am given this opportunity to pay a meager tribute to Emmet, the undoubted master of plastic surgery in gynecology.

Emil Noeggerath. The most classical paper of the thirty-nine volumes of the transactions of the American Gynecological Society was contributed by Emil Noeggerath in 1876, on "Latent Gonorrhea, Especially with Regard to its Influence on Sterility in Women." Justice could be done this marvelous paper only by quoting it almost in its entirety, as nearly all of it has stood the test of time and as it contains little that could be eliminated.

[1] Presidential address before the American Gynecological Society, White Sulphur Springs, West Virginia, May 19, 1915.

The following extracts are so notable that I beg the privilege of quoting them:

"Now, Mr. President, this combination and development of symptoms, physical as well as rational (referring to cases reported), you will never encounter in women married to husbands that have not exposed themselves to the dangers of venereal affections. I say, advisedly, never! and if any one has a right to speak thus positively, I claim this privilege. . . . .

"The affection (gonorrhœa) is cured, in the male, whenever the urine — loaded with, or even without, the *antidotes*[1] — comes in contact, and sweeps away the newly formed secretion, while beyond this point the disease often persists for life in a milder form. . . .

"Among one hundred and five cases, of which I have written notes, I found —

"10 patients suffering from acute and subacute *perimetritis;*

"8 patients suffering from recurrent perimetritis;

"38 patients suffering from chronic perimetritis;

"17 patients suffering from chronic ovaritis;

"32 patients suffering from catarrh of the uterus, apparently uncomplicated. . . .

". . . . the non-puerperal is always *perimetritic*. . . .

"Wherever I have had occasion to examine post-mortem under these circumstances, I have found the existence of salpingitis; and in those cases which could be carefully investigated during life, the history of gonorrhœa, either in the patient herself or in her husband, has rarely been absent. . . .

"With regard to recurrent perimetritis, I venture to state that every single case has its remote origin in gonorrhœa. . . .

"This catarrh extends upward to the fundus, and always into the fallopian tubes. The vaginal mucous membrane is often intact, while that covering the vulva is, as a rule, involved to some extent. . . . It is (signs of gonorrhœa) catarrh and erosion of and around the orifices of the ducts of the vulvovaginal glands."

Noeggerath reported the microscopic findings from the examination of semen in fourteen husbands of women suffering from sterility: in seven of them he found an absence of spermatozoa, in four defective spermatozoa, and in three a large number of living spermatozoa.

This paper comments upon the observations of Littre, 1711, E. Berntz, Cusshman, Vosselin, and Liegois, on the pathology and observations in cases of gonorrhœa.

Very little has been added to what Noegerrath gave in this paper on the etiology and macroscopic pathology of gonorrhœa. The discovery of the gonococcus by Neisser made it possible for Noeggerath's followers finally to appreciate and assimilate his teachings. The facts presented in Noeggerath's paper were so thoroughly supported by recorded observations and logical deductions that it seems impossible that they were not appreciated and accepted at that time. The slowness with which his discoveries were accepted is well illustrated by quoting a discussion made sixteen years later by one of our most highly esteemed Fellows, who said: "I must admit that I have found myself entirely at variance with Dr. Noeggerath with regard to the effects of gonorrhœa in women."

I. ANATOMY, PHYSIOLOGY, AND BACTERIOLOGY

Creditable papers have been presented upon the anatomy of the pelvic floor, the anatomy and development of the hymen, and upon the anatomy and physiology of the ovary. The contributions upon the corpus luteum have added to our knowledge of the menstrual disturbances.

One excellent and two creditable papers have been contributed upon bacteriologic subjects.

II. INJURIES OF CHILDBIRTH

Laceration of the perineum. J. Collins Warren, in 1882, presented a valuable and original paper on repair of complete laceration of the perineum, which consisted chiefly in individual dissection and suture of the sphincter ani muscle. Emmet's contributions upon this subject have been mentioned above. Twelve other papers upon laceration of the perineum are concerned largely with individual suture of the sphincter ani muscle or improved methods of restoration of the

[1] Italics mine.

injured levator ani muscle and its fascia, all of which are fundamentally modifications of the Emmet or Hegar operation.

Cystocele and urethrocele. Nineteen papers have been contributed upon the former and four upon the latter subject. Numerous operations have been advocated for repair of cystocele, notably elytrorrhaphies, anterior vaginal fixation of the uterus, fixation of the round ligaments, the Goffe operation, interposition of the uterus, and suspension and fixation operations by abdominal section. Shortening of the uterosacral ligaments has also received much attention in conjunction with the above mentioned operations. The relative value of these procedures has not been entirely determined; their merits at present seem to be largely a question of the individuality of the case and the experience of the operator.

Four papers deal with urethrocele and indicate that it is best treated by restoration to its normal location and fixation by lateral sutures to fixed tissue, or by fixation in conjunction with some of the cystocele operations.

Vesicovaginal fistulæ. Nine papers appear on this subject, excellent papers having been contributed by Emmet, Bezeman, and others. The more recent papers show that the chief improvements which have been obtained over the Sims and Emmet operations have consisted chiefly in making sufficient separation of the bladder laterally and from the cervix to permit approximation without undue tension upon the sutures.

Laceration of the cervix. Eleven papers appear upon laceration of the cervix. The fact that only one paper appears in the transactions since 1892 indicates a unanimity of opinion upon this subject. The Fellows probably seldom operate now for laceration of the cervix except in conjunction with other operations, and then only for the removal of much hypertrophied tissue or extensive erosions; and they adapt the kind of operation to the individual case.

III. PELVIC INFECTIONS

Our transactions contain very little information relative to pelvic infections, except in the paper of Noeggerath above considered, before the date of publication of Tait's work upon salpingitis. From this time on the Fellows of this society took an active and important part in the clinical study, in the pathology, and in the treatment of infections of the fallopian tubes and ovaries. This work represents a period of rapid advancement of the knowledge of the pathology and treatment of pelvic diseases. Notable papers were contributed relative to the conservation of tissues and organs.

The impunity with which the ovaries were removed at that time is well illustrated by quoting from a discussion made by one of our prominent Fellows in 1894, who said: "For no one, I think, but an extra conservative would wish to leave them (the ovaries) after removing the tubes." Some of the earlier papers suggested at least the belief that ovulation in some patients was detrimental to health.

Many papers were presented and much discussion given during the years 1892 to 1903 upon such topics as the indications for hysterectomy when both tubes are removed, conservative operations upon infected tubes and ovaries, and vaginal versus abdominal section.

The frequent involvement of the appendix in cases of pelvic infections, the importance of general abdominal exploration, and the advances made in asepsis, were prominent factors in determining the relative values of abdominal and vaginal celiotomy.

The fallacies of curettage as a curative remedy in so-called endometritis have been established.

The relation of appendicitis to pelvic diseases was called to the attention of the society in 1892 by Keating. Ten other papers have since appeared upon this subject.

The study of infections of the urethra, bladder, and kidney has not been neglected by the society.

IV. DISPLACEMENTS OF THE PELVIC ORGANS

Forty-eight papers have been contributed upon displacements of the uterus, not including prolapse which was considered elsewhere. If we concede that the only pathologic

uterine displacement, excluding complications, consists in disturbance of its "health line," then we must conclude that not all of these papers were valuable and original productions. Most of these papers deal with ventral suspension, vaginal fixation, and round and uterosacral ligament operations. The round ligament operations have finally become the ones almost universally employed.

Seven creditable papers have been presented upon inversion of the uterus. An original contribution given in 1899, which consisted in posterior vaginal incision of the constricting ring, is deserving of special mention. This operation has been improved by an anterior vaginal incision of the constricting ring.

V. PELVIC NEOPLASMS

The transactions contain fifty-one papers upon uterine fibromyomata. The large number of papers upon this subject is a natural sequence of the great advance that has recently been made in the treatment of uterine fibroids. Interesting and valuable papers appear in the transactions upon —

a. Removal of fibroids by enucleation through the vagina.

b. Fixation of the pedicle in the abdominal wound.

c. Elastic ligature for the pedicle.

d. Vaginal fixation of the pedicle.

e. Total hysterectomy.

f. The classical hysterectomy of Barr, Goffe, and Palmer Dudley.

g. Myomectomy.

The American Gynecological Society has done valuable work in the development of the perfected operations for uterine fibromyomata. Gordon's dictum, "Fibroid tumors that produce symptoms should be removed," has been vigorously opposed but finally has become generally accepted. Papers on the degenerative changes in fibroids, on the history of hysterectomy, and on the circulation in fibroids are valuable contributions.

Cancer of the uterus. There are thirty papers upon cancer of the uterus. John Byrne contributed excellent papers upon this subject in 1877, 1889, 1892, and 1896. Byrne's results, as given in his statistics, are the best that appear in our transactions.

Forty-two papers have been contributed upon ovarian and other pelvic tumors.

It is interesting to note that seventy-six papers appear upon medical gynecology.

The society has done very creditable work upon repair of injuries to the ureters. A large amount of good work has also been done upon tuberculosis, technique, post-operative complications, menstrual disturbances, and sterility.

In reviewing our work I have appreciated the danger of criticism in giving individual credits to men still active in the work. It is impossible to give you all the credit which you deserve. Although our transactions often show the need for work that can only be done in large clinics with adequate financial support, our thirty-nine volumes is a valuable contribution to gynecological literature.

WHAT IS THE FATE OF THE OVARIES LEFT IN SITU AFTER HYSTERECTOMY [1]

By HIRAM N. VINEBERG, M.D., F.A.C.S., New York

THE writer, at the outset, will confess he has always been prejudiced against leaving behind one or both ovaries, when, for one reason or another, the uterus had to be removed. This prejudice was born of an experience early in his surgical career, when he was compelled to operate for the purpose of removing the ovaries in a young woman in whom the uterus was congenitally absent and who had suffered severely from menstrual molimina from her sixteenth year onward. He could not comprehend wherein lay the difference between this congenital condition and that created by the operator when he removed the uterus and left the ovaries *in situ*. Still, notwithstanding this state of mind, he could not escape the influence, from time to time, of the glowing reports in the literature made by distinguished operators of the great advantages accruing to the patient from having one or both ovaries conserved, when the uterus had to be removed. These patients, so the reports stated, were spared the annoying and sometimes the distressing symptoms of the climacteric, and many of the other phenomena said to be due to the lack of the material which the ovaries secrete. It would seem, as if by a trick of fate, that of the few instances in which the writer allowed himself to be influenced in this manner, two of his patients had to undergo a secondary laparotomy because the retained ovary had undergone cystic degeneration. It therefore occurred to him that it might be of interest and of scientific value to ask, what changes actually take place in the ovaries that are left *in situ* after the uterus has been removed, and how frequently do they undergo cystic and other degenerations necessitating secondary operation for their removal? In order to obtain all the data possible, the writer took the liberty of writing to most of the Fellows of the American Gynecological Society asking them if they would not kindly investigate their cases regarding this point and present their results in the discussion of the paper. In this way valuable data could be obtained which might serve as a guide in our future work.

A search of the literature with the stated object in view did not disclose very much material upon the subject. A list of articles upon the subjective side of the subject were encountered, but comparatively few dealing with it from the objective side. This perhaps is natural from the exigencies of the subject, for the opportunity is not often offered to examine the retained ovaries microscopically a variable period after the hysterectomy. The observations made as to the changes of the retained ovaries, based upon a bimanual examination, we all know are practically worthless. Reports of autopsies regarding this point are found only here and there in the literature. As a substitute for this deficiency, experiments have been made upon rabbits by several observers. Grammatikati (15) who was the first to make such experiments — that is, excising the uterus from the rabbit and later examining microscopically the ovaries that had been left *in situ* — found the ovaries had shown practically no retrogressive changes; the follicles were found in every stage of development and the ovarian tissue was normal in every respect. Mandl and Buerger (20) later made an extensive series of similar experiments. Their results differed in some respects from those of Grammatikati. They examined the retained ovaries after a period varying from eight months to three years. In all instances, whether after the shorter or longer period, they found numerous follicles in various stages of development and retrogression up to the formation of typical corpora lutea. But the number of primordial follicles was less than those found in the control animals. In addition, they found in the ovaries of the rabbits experimented upon

[1] Read before the American Gynecological Society, White Sulphur Springs, West Virginia, May 15–18, 1915.

effusion of blood into the larger follicles with cystic degeneration of some of them, and decided evidences of a certain degree of atrophy of the entire organ. Summing up the results of the histological findings in the four series of experiments upon rabbits, they state that after the extirpation of the uterus, regardless as to whether the elapsed time was of longer or shorter duration, they observed certain changes in the ovaries which justified the conclusion, first, that the blood supply of the retained ovaries did not correspond to the normal; second, that the return flow of the blood was interfered with, leading to congestive changes with all their consequences, and that also the developmental changes on the surface of the organ were, to a certain degree, interfered with; so that, altogether, the functionating condition of the organ, in a certain sense, was rendered more difficult.

These observers made similar experiments upon apes, but they state that while this species is more closely related to the human, there is such a great difference in the follicular development and retrogressive changes in their ovaries from those observed in the human ovaries that they are not as well suited for experimental study as the rodents.

The results of the experiments in the apes showed also some evidence of congestion and a tendency to cystic formation.

The experiments of Burckhardt (8) and Keitler (18) upon rabbits gave results similar to those obtained by Mandl and Buerger (20). The discrepancy between the results obtained by these observers and those by Grammatikati is explained by the circumstance that the latter's observations were made from three to four months after the uterus had been extirpated; in other words, the elapsed period was too short for any changes to have taken place.

Keitler very properly draws attention to the fact that the results obtained by experiments upon rabbits cannot entirely be applied to the human, inasmuch as the blood supply to the ovary of the rabbit differs essentially from that to the ovary of the human female. In the ovary of the rabbit the blood is supplied by an independent single artery, while the human ovary receives its blood from two different arteries, the ovarian or spermatic and a branch of the uterine, which he names the "ramus ovaricus." The branch of the uterine going to the ovary is usually of larger caliber than the spermatic artery. Hence, in removing the uterus from the human female, the retained ovary is deprived of the greater part of its blood supply, which is not the case when the same operation is performed upon the rabbit.

Recognizing the importance of the blood supply of the ovary coming from the uterine branch, the advocates of retaining the ovaries, as for instance Olshausen and Werth (26), recommended a technique whereby this blood supply should not be disturbed. To test the validity of this technique Keitler made a number of experiments upon the cadaver in which the vessels had been previously injected. He found that in every instance in which the technique as described by these authorities had been faithfully carried out, the ovarian branch of the uterine artery was cut off. He then endeavored by the most careful and tedious dissection, such as would not be feasible in the living subject, to remove the uterus without interfering with the course of the "ramus ovaricus." This, he was enabled to do only in a very few instances; in nearly all the cases the vessel had to be cut.

Olshausen advocates another technique for the same purpose, which consists in burying the ovary between the two layers of the broad ligament. Other operators are of the opinion that this technique may favor the development of cysts and other degenerative processes. Werth lays great stress upon suturing the ovary to the angles of the cervical stump and suturing the layers of the broad ligament to the tunica albuginea. Zweifel and Abel (1) are strongly of the opinion that there is an interdependence between the uterine mucosa and the ovaries, and that in order to prevent a rapid atrophy of the retained ovaries some of the endometrium must be conserved. Hence they advocate and practise a very high amputation of the uterus. Mandl and Buerger (20) and others dispute this claim of Zweifel and Abel (1) and they claim these authors attach much too great importance to the influence of the

uterine mucosa upon the ovaries. The criticism may be well taken theoretically, but practically we know that menstruation will continue normally if only enough of the mucosa and uterine tissue is conserved. And as long as menstruation persists, we may safely assume that the ovaries continue functionating.

But the important question under consideration is, for how long a period do the ovaries continue functionating after the entire uterine body has been removed? As has already been stated, the objective data bearing upon this point are rather limited in number.

Grammatikati (15) examined the ovaries of a woman who died from an intercurrent disease, three years after a total extirpation of the uterus for carcinoma. There were no evidences of any atrophic changes; follicles were found in all stages of development and a false corpus luteum was observed. Keitler performed autopsies in five cases, but he thinks the patients were too far advanced in years to attach any significance to the results. This comment certainly does not hold good, for at least two of the patients were 42 and 46, respectively. In the patient of 42 it was not stated how long a time had elapsed after the hysterectomy. The retained ovary did not show any marked atrophy, but there were found numerous ripe follicles as well as several primordial follicles. In addition there were seen on the surface of the ovary several cysts the size of beans. In the patient of 46 the autopsy was done four years after the hysterectomy. Both ovaries were markedly atrophied and cystic, and no follicles were found. In two other patients, both 50 years of age, autopsy was done three years after the hysterectomy for carcinoma. In both instances the ovaries were greatly atrophied and markedly cystic, and no follicles were observed. Keitler (18) quotes Gottschalk who did a secondary operation a year after the hysterectomy and found the retained ovary contained numerous ripe follicles. Mandl and Buerger (20) report a case of secondary operation in a patient of 40, five years after a vaginal hysterectomy for parametritis and an abscess the size of a closed fist in the cul-de-sac of Douglas. The left ovary was left behind, as it could not be removed on account of dense adhesions. The right adnexa appeared normal and were left *in situ*. The second operation consisted of a laparotomy for the removal of a right hydrosalpinx and adherent ovaries. The right ovary contained several ripe follicles but a great many were in a state of atresia. There were other evidences of atrophic changes. The left ovary was for the most part converted into a cyst. Normal follicles were not found in either ovary. Pronai had the opportunity to examine the ovaries of a woman, 31 years of age, in whom four and one-fourth years before, a vaginal hysterectomy had been done for adenocarcinoma of the body of the uterus. The secondary operation was a laparotomy for a recurrent growth. Both ovaries were the size of a hen's egg, and microscopic examination showed a great decrease in the number of primordial follicles. There was a total absence of corpora lutea and only a few markedly atrophied corpora candicantia were present. Therefore it may be stated that the ovaries did not possess a full functionating capacity but presented the beginning stages of atrophy.

Holzbach (17) reports the case of a woman 39 years of age upon whom a vaginal hysterectomy for carcinoma was performed in February, 1899. The woman suffered for six months afterward from attacks of irritability, excitability, hot flashes, etc., at intervals of four weeks, lasting from two to three days. She was operated upon again in 1906, seven years later, for a recurrent growth in the pelvis. There was a hydrosalpinx of the left tube. The left ovary was cystic and enlarged and was the seat of a carcinomatous growth involving more than half of the organ. The cortex and albuginea were for the most part suffused with blood. There was marked hyaline degeneration of the numerous obliterated vessels. Large corpora albicantia were present but no follicles. The right ovary was imbedded in adhesions. It was about the normal size and presented a good sized hæmatoma of corpus luteum origin. There were several corpora albicantia and follicles in every stage of development.

Agnes Bluhm (6) cites a case of a woman 40 years old, upon whom vaginal hysterectomy for fibrosarcoma of the vagina was done in 1900. She was operated upon again in 1903, three years later. The right ovary showed but slight changes from the normal. The left ovary contained a fresh corpus luteum. In addition, there were several old corpora lutea. There were small follicular cysts the size of peas, lying close together, thus showing a commencing cystic degeneration.

Werth (26) had an opportunity to examine the retained ovaries in four cases. Case 1. Age 42 years, supravaginal hysterectomy for large fibroid. Both ovaries were left *in situ*. Laparotomy, 18 months later for intestinal adhesions, revealed the left ovary to be scarcely of medium size, while the right ovary was double the normal size. Both ovaries were covered with smooth adhesions. No report of any microscopic examinations. Case 2. Age 50 years, supravaginal hysterectomy for multiple fibroids. The left ovary was retained. The patient died suddenly a month later from pulmonary embolism. At autopsy, the ovary was apparently normal. No microscopic examination made. Case 3. Age 32 years, September, 1890, vaginal hysterectomy for cervical cancer. Both ovaries and tubes were apparently normal, and left *in situ*. The patient died of recurrence, December, 1899. The left ovary was of medium size and the tube was adherent to the sigmoid. The right adnexa healed normally; the only change noted microscopically was a hyaline degeneration of some of the follicles. Six months before death the patient was seen by Werth. She had had no menstrual molimina, nor any of the symptoms referable to the climacteric. Werth presents the case as a forcible illustration of the value of conserving the ovaries. But to the writer the illustration does not appear so conclusive, inasmuch as a woman who has had a comparatively early recurrence which ends in death a little over three years after the operation is probably suffering from severe symptoms due to the recurrence, which would overshadow any that might occur dependent upon the artificial climacteric. Case 4. Vaginal hysterectomy for intraligamentary fibroid. The patient died eight months later from ileus. Werth attaches no significance to the case, but states he reports it merely because of the dearth of such material in the literature.

From the foregoing observations in animals and in the human subject, the conclusion is justifiable that the ovaries continue functionating for a longer or shorter period after the uterus has been removed, in spite of the fact that, at least in the human subject, the blood supply of the ovary is very materially disturbed by the operation. It has also been fairly well established that a progressive atrophic process sets in some months after the operation, but the data are as yet insufficient to enable us to say at what period this process becomes so complete as to destroy all of the follicles. It is to be hoped that opportunities will occur in the near future by which it may be possible to collect sufficient data upon that point.

The writer will now turn his attention to the reported cases of cystic and other degeneration of the retained ovaries found in the literature.

A. Martin (quoted by Abel, 1) performed supravaginal hysterectomy for fibroid growths in a woman 37 years of age, leaving the right adnexa, which looked perfectly normal, *in situ*. Seven months later he was compelled to operate again for an enormous cyst of the ovary, filling the entire abdomen.

Pean (22) reports a case in which at the next menstrual period following the operation there was a hæmorrhage from the retained ovary leading to death. Prochnowick states he had to operate the second time in four cases on account of malignant degeneration of the ovaries left *in situ*.

A. Calman (9) reports a case of hysterectomy for fibroid tumor with disease of the right adnexa, which he removed. The left ovary appeared normal and was left *in situ*. Three years later a second operation was necessary for a cyst of the size of a fœtal head (evidently a corpus luteum cyst). The patient suffered from the climacteric syndrome after the first and after the second operation.

G. G. Bantock (5) relates a case in which he had to perform ovariotomy for cyst of one of the retained ovaries seven years after a vaginal hysterectomy for cystic disease of the uterus. No trace could be found of the other retained ovary.

Littauer showed an ovarian tumor the size of a closed fist which he removed per abdomen, nine months after a vaginal hysterectomy for fibroid.

Olshausen reported four cases of cysts of the retained ovaries necessitating a secondary operation after vaginal hysterectomy for carcinoma uteri. These occurred three months, five months, sixteen months, and nine years, after the primary operation. Although a warm advocate of retaining one or both ovaries, he added he could report several more cases of cystic degeneration of the retained ovaries.

Fischer reported a case of cyst, the size of a closed fist, of the retained ovary two and three-fourths years after vaginal hysterectomy for chronic metritis and diseased right adnexa.

Waldstein cites four cases of cystic degeneration of the retained ovarian tissue, occurring in Schauta's clinic after hysterectomy, but in these instances there was no intention of leaving any ovarian tissue behind.

Werth narrates the histories of two cases operated upon for cystic degeneration of the ovaries following a vaginal hysterectomy; one for myoma, the other for tuberculosis of the uterus and of the tubes.

Mandl and Buerger (20) report one case in which the retained ovary was converted into a cyst, the size of a hen's egg, three years after hysterectomy.

Abel (1) is credited by several writers with the report of cases of cystic degeneration of the retained ovaries after the uterus had been removed. A careful perusal of Abel's article by the writer has failed to find any such cases. Abel states that in some cases he was able to determine an enlargement of the retained ovary some months after the hysterectomy, but that at a later examination the ovary was found much reduced in size. His article is based on Zweifel's method, whereby the ovaries are retained with as much of the uterine tissue as possible, so that a portion of the uterine mucosa is conserved.

The writer wrote to several of the Fellows asking them to kindly come prepared to the meeting with data collected from their own experiences conserving secondary operations for cystic or other degeneration of the retained ovaries following hysterectomy. Owing to his inability to attend the meeting last year, the paper was not read until the meeting of this year, and it will be instructive to embody the replies received from the Fellows last year.

Dr. H. C. Coe wrote he had had three cases requiring secondary operation for cystic degeneration of the retained ovaries. He adds that even when the ovary does not become cystic it sinks to the bottom of the Douglas cul-de-sac, causing painful symptoms.

Dr. Palmer Findley writes he can recall but one instance wherein the ovary became markedly enlarged through cystic degeneration, following a vaginal hysterectomy. He adds: "Do you find the ovaries occasionally undergo an acute degeneration, but disappear more or less after a number of weeks' time? A condition which I describe to be temporary obstruction to the circulation."

Dr. I. S. Stone relates a case of secondary operation for obstruction. He states that he found the retained ovary dark, almost black with venous blood, and swollen to more than double its size.

Dr. Thomas S. Cullen states that he leaves the ovaries, wherever it is possible, in patients under 45 years of age, and that he has yet to see any apparent trouble develop as the result of the ovaries being preserved.

Dr. W. M. Polk writes: "I have had no bad results from leaving ovaries when operating, but confess that I think the procedure has only a sentimental value. When first I advocated it many years ago, it was during a period when ovaries were being transplanted. It was my hope that these ovaries might live, and at any rate mitigate the enforced menopause of patients upon whom hysterectomy had been performed. As I have intimated, however, I did not think that any real mitigation occurred. This fact, together with a feeling that such an ovary might serve as a nidus for a subsequent tumor, occasioned me to abandon my former plan and take the ovaries along with the uterus."

Dr. Joseph Brettauer: "Until quite recently I always removed the ovaries with the uterus when operating for fibroids. Within the last year or two, I have left them *in situ*, but have had no opportunity to observe results as yet."

Dr. Howard C. Taylor: "I rarely leave an ovary when I do hysterectomies." He asks "if an ovary that has been resected and left in becomes cystic more frequently than a normal ovary."

Dr. W. W. Chipman makes it a practice of always leaving the ovary when a hysterectomy is performed, if they are at all healthy, no matter what the age of the patient may be. Clinically he has seen no evil results from the procedure.

Dr. E. B. Cragin's records show 353 hysterectomies in which one or both ovaries were left behind, and there is no record of any case having returned with any condition of the ovaries requiring a second operation.

Dr. Wm. P. Graves usually takes out the ovaries with the uterus.

Dr. W. E. Ford left in ovaries only after a vaginal hysterectomy, a practice which he gave up several years ago. He never believed in leaving the ovaries in from the first, and therefore always removes them with the uterus.

The following are brief histories of two cases of cystic degeneration of the retained ovary, in the writer's practice.

CASE 1. Mrs. B., age 28, had in July, 1905, a supravaginal hysterectomy for an interstitial fibroid the size of a fœtal head. Owing to her youth, the left ovary, which was apparently normal, was left *in situ*. The post-operative course was practically afebrile and she made an uneventful recovery. Five or six weeks after the operation she was attacked with typhoid fever. At the outset, until the diagnosis was established, there was considerable uneasiness whether the retained ovary might not have undergone a suppurative process causing the fever, as the patient had rather a thick and rigid abdominal wall and a bimanual examination was not satisfactory. The typhoid ran rather a severe course, but the patient ultimately made an uncomplicated recovery and she was restored to her usual good health. For the following eighteen months she suffered considerably from hot flashes and from nervous irritability. In October, 1909, an interval operation was done for appendicitis. The appendix was removed through an incision at the usual site and no attempt was made to inspect the pelvic contents. The recovery from the operation was normal and rapid. During the spring of 1912 the patient complained of attacks of pain in the left iliac region and on one occasion ran a moderate temperature, 101°-102°, for a few days. When examined by me in July, a cystic mass, the size of a mandarin orange was palpable in the left iliac region. In October, 1912, I reopened the abdomen, at the side of the old median incision, and found no visible trace of any ovarian tissue, but a cystic mass of the size stated above, most intimately and extensively adherent to the intestines. The excision of the cyst proved a most ticklish and tedious task. A determined effort was made to remove every vestige of the cyst-wall, and as far as one could judge with the naked eye, this was accomplished. The patient passed through a couple of stormy days after the operation, then the convalescence was afebrile and rapid. On bimanual examination, about three weeks later, the pelvis was found entirely normal. But on another examination about three months later a cystic mass the size of an English walnut was found in the region of the former cyst. The patient from time to time up to the present has twinges of pain in that region. The cyst, at times, seems smaller; at other times it appears to be about the same size. Before the third operation (that is for the removal of the cyst) the flashes had entirely ceased. "Since the operation the hot flashes have returned, lasting for a week or two at a time, without any regularity or rotation, that I can discover" (the patient's statement).[1]

CASE 2. Mrs. L. M., age 34, married nine years, 2 children, last child twenty-one months ago. On October 19, 1912, she had a supravaginal hysterectomy done by me for multiple fibroids, forming a mass the size of a fœtal head. There had been an operation for appendicitis some years before, and as a result the omentum was extensively adherent to the right parietal wall. The patient had very strong sentimental opinions against the removal of the ovaries, and a promise was given that one or both would be conserved if possible. As the right adnexa seemed perfectly normal, they were left *in situ* and attached by a couple of catgut sutures to the cervical stump, which was amputated high up at about the os internum. The recovery was perfectly normal and satisfactory. At the end of three weeks, on bimanual examination, the cervical stump was freely movable and the retained ovary did not seem any larger than it should be. January 15, 1913, the patient consulted me to see if it were possible that she had become pregnant. She stated she had spotted only twice since the operation. On examination I found a cystic mass the size of a closed fist in the right lower quadrant of the abdomen. March 15, she consulted me again on account of pain in the right iliac region, and a constant feeling of discomfort in that area. The mass did not seem to have grown any larger. In September of the same year, during my absence from the city, she was operated upon by another surgeon, who has kindly responded to my letter of enquiry that he found a cyst (size not stated) of the right ovary surrounded by adhesions, which he removed, the patient making a perfect recovery. The patient herself has written in reply that since the second operation she has felt perfectly well.

A third case was seen by the writer in his office, in which on bimanual examination a cyst of the size of a closed fist was found in the right side of the abdomen. There had been a hysterectomy some years before by another surgeon. As the diagnosis was not confirmed by operation, the writer lays no stress upon the case.

It will be seen from the foregoing that although the number of cases found in the

[1] The patient since this has had to undergo another operation for the removal of a small cyst extensively adherent to the intestines, the result of cystic degeneration of some ovarian tissue not visible to the naked eye at the prior operation.

literature of cystic degeneration of the ovaries necessitating a secondary operation is comparatively small, it is, nevertheless, a contingency which must be reckoned with. It may also be safely assumed that not all the cases with this unfortunate sequelæ have found their way into the literature. The writer realizes that his experience in this connection is probably unusual, but in all candor he cannot attribute it to the technique employed, which was in accordance with that in use by other operators. Besides, there does not seem to be any one technique agreed upon by those who have given the subject careful study by which such a sequela can be prevented.

The original intention of the writer was to limit his paper strictly to the question as stated in the title, but he thinks now such a limitation would be unsatisfactory. He feels that a few words relative to the clinical side may be expected of him. The interesting clinical phenomena connected with the subject are: I. Menstrual molimina. It will be recalled that the writer stated at the outset that the fear of this prejudiced him against the retention of the ovaries when the uterus had to be removed. This view was one entertained by Hegar and others. The symptom was present to a distressing degree in several cases reported in the literature, notably in the articles by Glaevecke (14) and Brennecke (7). Most writers admit its occurrence, even those who are strongest advocates of the retention of the ovaries. Brennecke (7) would gauge the rapidity with which the retained ovary undergoes atrophy by the duration of the menstrual molimina. Keitler (18) and Holzbach (17) rightly take exception to this view, inasmuch as the menstrual molimina, when present, usually cease after a period varying from six to eighteen months, while it is fairly well established that ovulation persists in the retained ovaries for a much longer period — in the cases of Pronai (24) four and a half years after the hysterectomy. Further, Holzbach (17) draws attention to the findings by Weber (25) in fifteen ovaries obtained from women long past the menopause. In four instances Weber (25) found follicles in the various stages of development, and in one case a corpus luteum. But the further argument used by Holzbach (17) regarding women with lactation atrophy, who sometimes are known to conceive without the recurrence of menstruation, is not well taken, because conception may take place as a result of the first ovulation following parturition and before the onset of the subsequent menstruation. We know many women do menstruate regularly during lactation, and we may be justified in assuming that in them the atrophy of the pelvic organs usually associated with that function has reached such a degree in the ovaries as to entirely preclude ovulation.

The crux of the whole question, whether the ovary or ovaries should be removed or left *in situ*, depends upon whether the symptom-complex known as the climacteric syndrome are obviated or lessened by leaving one or both ovaries behind. Undoubtedly at the present time the majority of operators are in favor of conserving the ovaries when the uterus has to be removed in women under 45 years of age. But a study of the literature brings out some very interesting facts regarding this point. For instance, in Mandl and Buerger's (20) monograph, by far the most extensive and carefully prepared article in the literature, it is noted that in a series of 100 cases of hysterectomies in which the ovaries were removed, climacteric symptoms were entirely absent in 23 cases. They were moderate in 26 cases, and severe in 51 cases; of these 51 cases, 2 were 45 years of age, 5 were 46, 3 were 47, 6 were 48, 3 were 49, one was 50, one was 51, and 2 were 52 years old. Thus 23, or 46 per cent, were above 45 years of age, and the nervous disturbances were as severe and the duration, in most of them, was longer than in the younger women. In many instances, they persisted for eight and nine years. A further interesting fact was noted in one case, that of a woman 48 years old, in whom the menopause had become established without any disturbances six months before operation. But a short time after the operation she began to suffer severely from the climacteric syndrome, which persisted for four years. Holzbach (17), in the writer's opinion, draws an erroneous in-

ference from this case, in that he adduces it was an evidence that the ovaries are active after the menopause. On the contrary, it furnishes strong evidence that the climacteric symptoms are not always due to the removal of the ovaries, but are just as likely to be due to the traumatism inflicted upon the pelvic nerves by the operation, a view first expressed by Glaevecke (14) and accepted by Werth (26) and others. The writer's first case would also support this view. The climacteric symptoms had disappeared years before the second operation for the removal of the cyst, which to the naked eye showed no ovarian tissue; then they reappeared after the second operation and are still present, though in a diminished degree, showing fairly conclusively that they could not have been reproduced by the removal of a cystic degenerated ovary, which practically contained no ovarian tissue. The inference, therefore, is very strong that they recurred as a result of the traumatism to the pelvic sympathetic nerves.

It had further been the writer's intention to refrain from drawing any conclusions at this time. But such a course he feels now would not be desirable. Hence he will assume the liberty of giving expression to his opinions, based upon a study of the literature, upon the experiences of others gained from personal communications, and upon his own experiences. In so doing he fully realizes that the accumulated observations of reputable operators during the next few years may place the subject in a different aspect.

1. There is still considerable uncertainty as to which tissue in the ovary is responsible for the production of the "internal secretion."

2. While it is established that the follicles go through the various stages of development in the conserved ovary or ovaries after the uterus has been removed, it is not at all certain that the function of the internal secretion continues uninfluenced by the great changes in the blood supply, and by the traumatism to which the pelvic sympathetic nerves are subjected as a consequence of the operation.

3. It is still a disputed point as to what degree the climacteric syndrome is due to the removal of the ovaries, and to what degree to the injury to the pelvic nerves incident to the operation.

4. Clinically it has been found that the freedom from the climacteric syndrome in hysterectomised women, in whom the ovaries have been conserved, is only relative to that which obtains in the same class of women in whom the ovaries have been removed. A generous estimate would be 20 per cent in favor of the former.

5. To obtain the benefits claimed by the advocates of conservation the ovaries should be retained at all ages and not limited to those under 45 years, as is done by most of them, inasmuch as it has been shown that of the women who suffered most severely from the artificial menopause 23 per cent were over 45 years of age.

6. Subsequent disease of the conserved ovary, such as cystic degeneration, malignant growth, inflammatory processes leading to adhesions, and pain calling for a second operation, does occur in some cases, the number, no doubt, being much larger than would be inferred from the records found in the literature.

7. In view of the foregoing conclusions, the writer is of the opinion that the doubtful clinical advantages accruing from retaining the ovaries in hysterectomy are more than counterbalanced by the risks to which the patient is subjected from subsequent disease and adhesions of the conserved ovaries. The writer would therefore not retain the ovaries in any case of hysterectomy, unless he could leave enough of the lower segment of the uterus with its endometrium to ensure the function of menstruation (Zweifel's method). For in his experience the knowledge imparted to the woman that her ovaries have not been removed has little significance or moral effect, when she learns that she will no longer menstruate.

Since writing the above, the following opportunity presented itself of examining microscopically, eighteen months later, one of the two ovaries that had been retained in a supravaginal hysterectomy for procidentia.

Mrs. A. H., age 23, married 4 years, 1 child, three years ago. Admitted to second gynecological service, Mt. Sinai Hospital, August 19, 1914.

Sixteen months before she had been operated upon in an out-of-town hospital for procidentia. The operation consisted in an abdominal supravaginal hysterectomy and suturing the stump to the abdominal wall. A few months later the patient noticed that the organs came down as before the operation. On admission there was complete prolapse of the long and large cervix, together with both vaginal walls.

August 21, operation; Longitudinal incision of anterior vaginal wall, dissecting bladder from the cervix, opening the peritoneal cavity, severing a long fibrous cord leading to the abdominal wall. Both ovaries were inspected. They were free from adhesions and the left ovary was removed for microscopic examination. The further steps of the operation consisted in suturing the cervical stump, after it had been shortened by a liberal excision of the lower part, to the anterior vaginal wall and a very extensive posterior colporrhaphy.

Report from the pathological laparotomy. The specimen of ovary received in fresh state measures 3.5 x 3 x 2.5 cm. A portion of the ovary at the hilum is missing. Grossly there are no abnormalities. The ovary shows several small cysts about the size of a pea, containing clear fluid, and on section, one rather old corpus luteum. Histologically, the surface epithelium is missing over the greater portion of the ovary. The tunica albuginea is well developed and the stroma intact and cellular. Follicles in all stages of development are present with well-preserved epithelium and ovula. A corpus luteum which is present is in the regressive stage. There are several small cysts lined by several layers of epithelium (granulosa cells). The vessels are normal in appearance, showing no sclerotic changes or calcification. The gross and histological study shows no evidence of atrophy or degeneration in the ovary.

Commenting upon the foregoing case, it must be borne in mind that ideal conditions presented for the preservation of the ovaries; the uterus was about normal size and there was no dislocation of the site of the ovaries, as so frequently occurs in the presence of fibroid growths of the uterus.

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OVARIAN TRANSPLANTATION

A Review of the Literature and Bibliography Up to and Including the Earlier Months of 1915[1]

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THE object of this report to the American Gynecological Society at this time is to bring the bibliography of this interesting subject up to date and to present a review of the work done since my last report to this society, presented in May, 1911, which report completed the record to January, 1911.

My first report on this subject, published in 1903 in the *Chicago Medical Recorder*, described two cases of heterotransplantation of the ovaries in human females, and contained a review of the literature. My second report in 1908 was presented to this society, as was also my third one in May, 1911.

The following is a résumé of the work accomplished in attempting to transplant ovaries in the human and animal, as recorded in the literature for the last three years.

W. E. Castle and John C. Phillips (70) reported in *Science*, 1909, that ovaries were removed from an albino guinea pig about five months old and in their stead were introduced the ovaries of a black guinea pig about one month old. The albino upon which the operation had been performed was then placed with an albnio male guinea pig and six months later bore two black-pigmented young. In many hundreds of matings of albnio guinea pigs observed by the authors only albino young were produced; so there seems no room for doubt that in the case described the black-pigmented young derived their color from the black animal that furnished the ovaries.

Shigeji Higuchi (81) in 1910 described his experiments on rabbits and gave the following conclusions: Ovaries transplanted autoplastically take well; and after more than a year, in spite of different changes, especially a marked decrease in size, all the parts of the ovary still remain and function. The mucous membrane and glands of the uterus become hyperplastic; the muscular wall in the direction of the mesometrium is of normal thickness, but toward the free side is very much decreased. The mucous membrane of the tubes and vagina is somewhat hyperplastic but not nearly so much so as that of the uterus. Ovaries transplanted from one female to another of the same species after the same length of time are either very much changed, having lost their typical constituent parts, and are atrophied, or else they disappear entirely. The mucous membrane and glands of the horns of the uterus and cervix show pronounced atrophy. The tube atrophies at the same time, the cervix and vagina later. Ovaries transplanted into males were completely absorbed.

W. E. Castle and John C. Phillips (88) in 1911 reported experimental work to disprove Guthrie's theory of foster-mother influence in ovarian transplantation. They described seventy-four cases of homoplastic ovarian grafting in guinea pigs and seventeen similar cases in rabbits. Only one grafted animal had young from her grafted tissue; in six other cases the grafted ovaries functioned but did not produce young. Ten animals regenerated their own ovaries and three of these had young. Forty-two showed at postmortem complete atrophy of the genital tract and absence of ovarian tissue. The remainder comprised fifteen cases in which results were not fully determined. Details of the experiments in the various groups of cases are given. In the cases where young were produced they gave no indication in their coloring of foster-mother influence.

W. E. Castle (89) again in *Science*, 1911, brought forward evidence to refute Guthrie's claim that the transplanted ovary in fowls functions and that the offspring show evidence of the influence of the foster-mother. He says Guthrie's evidence is insufficient.

C. B. Davenport (90) described six experiments in which there was no evidence

[1] Read before the American Gynecological Society, White Sulphur Springs, May 18-20, 1915.

that the engrafted ovary ever became functional; but all the results are in accord with the conclusion that the more or less completely extirpated ovary regenerated and produced an abundance of eggs.

C. C. Guthrie (91) reported evidence of some influence on offspring from engrafted ovarian tissue. By exchanging ovaries of fowls and breeding the fowls he has obtained results that seem to show that the transplanted ovaries retained their function and the resulting offspring presented evidence of some foster-mother influence.

Hartmann (92) in 1911 discussed Tuffier's work in transplantation of ovaries, including 130 cases on women. His work establishes beyond a doubt the possibility of autotransplantation of ovaries without suture and without vascular anastomosis; it is only necessary that they be placed aseptically in cellular tissue. But heterotransplants do not as a rule give any results; transplantation of ovaries preserved in cold storage never. Ovarian transplantation, however, does not prevent the development of the menopause. Hartmann finds this in accordance with his own clinical experience. He has never practiced ovarian transplantation, and he still believes that it is more rational to preserve the ovary with its normal connections. He does not think it is justifiable to remove a normal ovary from one woman to transplant to another, nor is it justifiable to transplant a diseased ovary; besides there is the danger of transmitting syphilis with the ovary. He thinks, from Tuffier's work, the operation should be abandoned.

A. Libroia (94) described experiments performed on young dogs; some of the transplants were autoplastic, some homoplastic. The animals were killed after periods varying from three to nine months and careful histological examination made of the transplanted organs. In those killed after the longer periods there was complete transformation of the ovary into fibrous connective tissue; in those killed earlier the central zone was so transformed, but the peripheral zone showed graaffian follicles, which, however, were undergoing cystic degeneration. In no case did he observe a re-growth of ovarian parenchyma as reported by Limon and Ribbert. He concludes that the transplanted ovary undergoes a slow and gradual transformation into fibrous connective tissue, the process being complete after about a year. The uterus, however, does not show the atrophy that it shows after double oöphorectomy. This is due to the fact that the degeneration is so gradual that the body is deprived of the internal secretion of the ovary very slowly and progressively, so that its withdrawal is scarcely noted. Microscopic pictures of the ovaries examined are given. Ovaries were transplanted into various tissues: subcutaneous connective tissue, muscle, spleen.

Charles R. Stockard (97) says that from experiments on thirty salamanders it appears that the fate of transplanted tissue depends largely upon the nature of the organ upon which it is transplanted. It grows better on the testis than on any other organ. The next most favorable organ is the liver, though liver-cells soon begin to encroach upon the ovarian mass, replacing and absorbing its cells. On other organs the ovarian tissue undergoes degeneration and absorption within a very limited time. Ovarian tissue implanted on the testis persisted with the stroma in good condition for more than seven months. On the liver it was found to contain ova and stroma after forty-five days. On the body-wall, lungs, kidney, and wall of the stomach the tissue disappears within about two weeks; only three indications of the ovarian tissue in more than fifty such transplants were found after forty-five days, and these had almost disappeared.

O. Uffreduzzi (100) describes experiments on rabbits and guinea pigs, designed to transplant ovary into the cavity of the uterus or into its wall, for the sake of rendering conception possible when the tubes are occluded, as in salpingitis. He concludes from his experiments that the ovary cannot be made to ovulate directly into the uterus; but as far as the transplanted ovaries are concerned they preserve their vitality. (Autoplastic grafts; experience extending over two years.)

H. S. Davidson (101) reports transplantation of the ovary in the human being with three cases. He transplanted ovaries into

the rectus muscle which was sewed over them with fine catgut. None of the patients had any recurrence of pain after removal of ovaries. In Case 1 the graft was unsuccessful, as the patient had distinct symptoms of menopause after the operation. In Case 2 a fibroid appeared after the operation. Without the presence of ovarian tissue somewhere, it is hardly probable that a fibroid would appear in the atrophied uterus that always follows double oöphorectomy. In Case 3, examination a year after the operation showed that the ovarian grafts had definitely grown and were functioning. The results are not conclusive proof that ovarian grafting is of great importance, but they show that it is certainly worth trial.

Emil Engel (103) stated that ovarian transplantation is justified as a treatment of symptoms of menopause in castrated women. He describes the following case: Woman of 27; both ovaries and uterus had been removed. The operation was followed by severe symptoms of menopause and the patient became so despondent that she threatened suicide. It was decided to transplant an ovary. The ovary was obtained from a case operated upon for myoma and was transplanted into the stump of the uterus per vaginam. Normal health was restored. Engel thinks that good results could be obtained in similar cases by transplantation of ovaries. If only a few women were benefited by this procedure, the operation would be completely justified.

W. Harms (104), in a series of experiments on transplantation of ovaries to a different species, reported failure.

M. Kawasoye (107) asks: "Can a transplanted ovary develop the same as one left in the normal position?" From his experiments on rabbits, which are described in detail, the author concludes that even when transplanted ovaries take well they undergo atrophic changes, which may be attributed to the diminished blood supply. These changes may be observed to a much less degree in ovaries remaining in position. It is, therefore, necessary in extirpation of the adnexa to leave the whole ovary, or as much of it as possible, *in situ*, with the least possible disturbance of the blood-vessels supplying it. Two colored plates showing microscopic pictures of ovaries are given.

A. Louise McIlroy (109), in discussing ductless-gland secretions, devoted a portion of her paper to ovarian transplantation and discussed the work of other authors.

G. Schöne (110) reviewed the literature of the subject and concluded, in reference to transplantation in animals, that in guinea pigs and rabbits homoplastic ovarian transplantation occasionally succeeds, though he questions whether the transplant persists permanently in animals that are not blood relatives. With reference to human transplantation he thinks the cases reported show that it may occasionally succeed.

E. Steinach (111) described some surgical techniques in which males were transformed into female secondary sexual characters by removing the testicles and implanting ovaries. The younger the animals were when the implantation was done, the greater the change in the sexual character.

W. E. Castle and John C. Phillips (114) reported in 1913 further experiments on ovarian transplantation.

There were 141 female guinea pigs grafted with foreign ovaries. About one hundred of these mated with males long enough to give definite indications of their ability to produce young. Only three actually produced young, but in seven others engrafted ovarian tissue persisted for many months, and was demonstrated post-mortem. In three cases in which young were produced the genetic characters of the mother were exaggerated, but never those of the graft. In 87 cases of the 141 no ovarian tissue whatever was found post-mortem, the castration having been immediately successful, but the transplanted ovaries having failed to persist for any length of time in the foreign body. The small percentage of successful transplantations indicates that transplantation will not be practically successful unless some means can be discovered of increasing the tolerance of the body for foreign tissue. The authors have considered the possibility of increasing the tolerance by keeping the tissue to be transplanted for a time in an artificial nutrient

medium or even in serum from the animal to be grafted, allowing a preliminary adjustment to the new environment; but they have not had an opportunity to try such methods.

DeRouville (115) reported as follows: Madame B., age 23. Nervous crisis; ovaries tender and painful; coitus impossible. The ovaries were removed and grafted under the skin of the abdominal wound. The patient's health was restored to normal; menses after the first two months normal. The ovaries lived and developed in the new situation for 18 months, at the end of which time they were removed. Microscopic examination showed the ovaries living, the graafian follicles in course of development, and a large hypertrophied corpus luteum in process of degeneration. After the removal of the ovaries the menses and intermenstrual discharge of blood stopped, showing that the menses had been produced by the transplanted ovaries, and not by any remnants of ovarian tissue left *in situ*, as often claimed in such cases.

A. Louise McIlroy (116) in 1913 discussed the question of ovarian grafting, describing her experiments on rabbits. The most successful grafts were found among those implanted into a vascular organ, such as the kidney or spleen. Ultimate degeneration took place, and absorption changes were most noticeably shown in the follicles. Grafts from the patient's own ovaries were more successful than those from another individual. The grafts became absorbed in time, but they served their purpose in assisting the organism to become gradually adapted to the changes in metabolism which occur when any interference takes place in the equilibrium maintained by the ductless glands.

S. Voronoff (120) gave a most instructive account of experiments he had done in ovarian grafts in sheep. Each experiment comprised operations on two ewes. Under local anæsthesia he removed the ovaries of one and substituted the ovary of another ewe. In practically every case the ewes bore healthy lambs, and were really not much affected by the operation. Six of the ewes operated on two years ago and four ewes one year ago were alive and well.

Beckwith Whitehouse (121) a year ago demonstrated a patient upon whom he had done heteroplastic ovarian grafting; i.e., the transplantation of an ovary from one patient to another. He now shows a case of autoplastic grafting in which the result has been entirely successful. The appendages had to be removed for old-standing inflammatory disease. A portion of the left ovary was grafted into the abdominal wall. The patient menstruated regularly a year after. A careful search was made for accessory ovary at the time of operation. Whitehouse thinks it much better to implant small pieces of ovary, "seedling grafts," than to try to transplant the entire organ. The best site is the rectus muscle or the subperitoneal tissue. Indicated in cases like his of old inflammatory disease; also in cases of severe dysmenorrhœa.

DeRouville (124) reported nine cases of autoplastic grafting of ovaries. From his experience it is his opinion that autotransplantation of ovaries is very unfavorable. He had only one really good clinical result (Case 3), one questionable result (Case 4), one favorable but of very short duration (Case 8). Except in Case 3 there was more or less rapid atrophy of the grafts. He concluded that, under the technical, anatomical, and clinical conditions under which he operated, ovarian grafts were not capable of permanent function, and even in the cases that were apparently most favorable his results were the same as those of Schiff with thyroid grafts in animals; i.e., the patients were deprived slowly and gradually of their ovarian secretion. He still thinks, however, that with improvement in technique and increased knowledge of anatomical and physiological conditions the results may be improved.

G. Frank Lydston (126), in an article, "Implantation of the Generative Glands and its Therapeutic Possibilities," describes (1) implantation of testicle in himself; (2) implantation of ovary from girl of sixteen, 12 hours after death, into woman of 59 suffering from nervous disturbance; ovary implanted into labium majus, with improvement in strength and nervous condition; (3) transplantation of testicle; (4) transplantation of ovary for dementia præcox; (5) transplanta-

tion of testicle into woman for dementia præcox; (6) transplantation of testicle.

He performed his transplantations into the preperitoneal space, the cul-de-sac of Douglas (extraperitoneally), the labium majus, beneath the mammary gland, the pubic region, the rectus muscle. He favors "exposed" implantation. "The methods of Tuffier and of Martin of implantation within the pelvis and rectus muscle of ovarian tissue from living donors is a procedure entirely different from that under discussion. Heterointraperitoneal implantation within the pelvis is unnecessary and has an element of danger."

Tschernischoff (127) described in detail his technique and stated that in autoplastic transplantation of the ovary in sexually mature rabbits the transplanted ovaries take in their new location and fulfill their functions for a long time. Homoplastic transplantation was performed on twelve rabbits and showed that the transplanted ovary may take and function for a while, but for a much shorter time than in autoplastic transplantation.

George F. Dick and Arthur H. Curtis (102) say that autotransplantation of ovaries is successful in a rather small percentage of cases. Homotransplantation is considerably less successful. Attempts to produce experimental rickets by means of transplantation of ovaries were unsuccessful.

One of the most important contributions on this subject, in point of number of cases operated upon, is the several reports made by Professor Tuffier of Paris, whose various contributions may be summarized as follows:

"During the past eight years, from November 15, 1906, to July 15, 1914, I have performed two hundred and four operations, thirty-five of which cannot be considered in this paper as they were performed only recently." This paper refers to a contribution read at the London meeting of the Clinical Congress of Surgeons of North America.

In speaking of homografting considerations, namely, from one human individual into another, he states: "I have performed this operation twenty-four times under the most favorable circumstances, but it did not prove successful. I have performed seven heterografting immediately after the removal of an ovary, or after the gland had been preserved in cold storage from one hour to forty-four days, and the operation has never given me a single functional result."

In speaking further of homografting he says: "I have transplanted an ovary from one young woman to another who presented, after the removal of ovaries and tubes, very severe symptoms simulating change of life. There was every chance for success as the patients were of the same age and of the same complexion. I should have been successful, but the blood of the patients was either hæmolyzed or agglutinated on coming in contact. The results were nil."

However, he states, "I think with an improvement in technique we may later succeed in this procedure, because the mechanism of absorption in such cases is well known. It is the same as for any foreign element — the foreign element being destroyed by the macrocytes. If we could prevent the macrocytes from attacking the grafted ovaries, it would be possible to obtain success. We already have learned from Carrel's experiments that the transplantation of limbs always gives a better result when the animal is infected. It is probable that the macrocytes in infected cases are occupied in struggling with the microbes and, consequently, are less liable to attack the grafted limb. While it is not within the province of surgery to produce infection in the human body, we do hope that some chemical substance will be discovered that may be used to protect the grafted ovary." Speaking of autografting he says: "I have performed 145 of these operations. Two circumstances under which the operation may be performed may be cited: First, in total hysterectomy and transplantation of one or both ovaries in whole or in part. Eighty-four operations were performed in this way. The graft takes and every month it increases in size. This continues for two or three years, but without any benefit to the patient. Second, I perform this operation in salpingitis, where the uterus remains in place. Sixty-five operations have been performed following this technique."

Tuffier discusses this whole subject under —

1. Justification for this operation.
2. Surgical technique.
3. Results.
4. Indications and future possibilites.

He feels that the symptoms of menopause following the removal of appendages can be relieved if a portion of the ovaries can be preserved and transplanted.

His results, he feels, justify the performance of this operation. His technique is extremely simple. "I take the ovary, or a portion of it, in a sterilized compress; the peritoneum of the abdominal wall is supported by the finger deeply inserted into the adipose tissue, and the ovary put into this opening and left there. When the glands are surrounded by adhesions they are very often torn in freeing them, their surface becomes irregular, and they appear wasted. Often, also, they are sclerosed or contain cysts, but even in such instances the glands may be made use of and the results are good. If the glands are not quite aseptic, they may be dipped into tincture of iodine or passed through the flame of a lamp. The result in these cases, however, is not so good. In cases of cystic change the ovaries must be opened before grafting. A small section of the pedicle of the gland is sometimes needed to enlarge the surface for future adhesions. In some recent cases the glands were divided into equal parts and implanted separately. This is done in order to obtain the smaller grafts and larger surfaces for adhesions."

Results. He summarizes under —

a, clinical,
b, anatomical, and
c, physiological.

Clinical. After the transplantation where the uterus is left in place, the ovary remains unaltered for three or four months and seems to lie dormant. Sometimes it is a little tender, and the patient has all the symptoms of change of life. But after a while the ovary becomes active, enlarges, and is sometimes painful for five or six days, whereupon all symptoms subside and menstruation reappears. Generally the congestion of the ovary precedes menstruation by five or ten days. On the same day when menstruation has commenced, all the symptoms of menopause disappear entirely. It is certain that with the grafting of an ovary the normal condition of the patient can be maintained. Speaking of the danger of the operation, he says: "This operation presents no more danger than does classical hysterectomy." Speaking more definitely of the menstruation results, he says: "Of the sixty-five patients upon whom I performed autografting operations without hysterectomy, I have interviewed thirty-seven from one to six years after operation, and thirty-two had their periods regularly. In the five cases which did not have regular periods, two important points were noticed. First — the patients were either more than forty years of age, or second — they were septic cases where it was necessary to dip the graft into tincture of iodine." He differentiates menstruation following these operations due to a portion of an ovary being left in the abdomen, and due to the graft, by the following observation: "When menstruation is dependent upon the part of the ovary left in the abdomen (1) it appears two months after the operation, and I have never seen such a quick result from a graft; (2) the grafted ovary does not become enlarged just preceding menstruation, and it is curious to note that every time one ovary has been grafted and the other left in the abdomen, the graft never produces menstruation."

Under anatomical considerations, he states that grafted ovaries are the cause of menstruation by the following illustration: Transplant removed after four and one-half years. Macroscopically, a corpus luteum is found. Another transplant removed after three years contained a cyst the size of a nut; the veins and two of the arteries were the size of the finger. This case also contained a corpus luteum. Another was removed two years after regular menstrual flow had been established. The epithelial zone was regular, except where small hæmorrhages were found.

In summarizing his future possibilities, he says: "All recent cases of salpingitis, and all malignant diseases contra-indicate the procedure. After the fortieth year it is unnecessary. Another local contra-indication

exists in cases where strong adhesions are present between the ovaries and pelvis. In these cases, if the uterus is not removed, the patient always complains of pain in the lower abdominal region. With these exceptions, I can say that I am sure that my operation is a good one. Menstruation in young and very nervous women must be preserved, and especially in those suffering from hyperthyroidism, as these patients often exhibit nervous and congestive troubles.

"Ovulation without menstruation is, as I have explained, altogether useless. Improvement in heterografting is the most desirable advance at present. It should be stated that where the uterus is absent, ovarian transplantation is of no value."

Another very important recent contribution on this subject is one derived from the clinic of one of our Fellows, Dr. Frank F. Simpson of Pittsburgh, as contained in a paper by his associate, Dr. Sidney A. Chalfant.

"It sometimes happens," the author states, "that either from infection or damaged blood supply it is not safe to leave the ovary in the peritoneal cavity. All have been confronted by such a dilemma, and have wished for a simple solution of the problem."

In the clinic of Dr. Simpson this autotransplantation is made by placing a piece of the better part of one ovary into the subcutaneous fat of the abdominal wall, about two inches inside the anterior superior spine of the ilium on the right side. This particular location for the transplantation was chosen for the following reasons:

1. In case of infection or gangrene of the graft it could be removed by cutting one or two stitches.

2. In case of later pain the graft could be removed under a local anæsthetic without the necessity of a laparotomy.

3. The blood supply is comparatively good, from the superficial and branches of the deep epigastric arteries.

4. Protection is afforded by the anterior superior spine.

5. If infections of the graft occur, the abdominal wound will not be involved.

6. This point is easily accessible at the conclusion of the operation.

7. Most important of all, it is free from the dangers of intraperitoneal or retroperitoneal transplantation when there is a possibility that the graft is already infected.

The technique of the operation is as follows:

After the ovaries are removed, a portion or all of the better one is kept in normal salt solution at body temperature until the operation proper is completed. Then a small incision is made through the skin about two inches inside the anterior superior spinous process of the ilium. A pocket is made in the subcutaneous tissue by spreading a hæmostatic forceps, and into this pocket a section from the cortex of the ovary (about 2 x 2½ cm.) is inserted and the skin closed by plain catgut suture. This same technique is followed on all the subsequent cases, except that in some transplantation is made on both sides.

Dr. Chalfant reviews the literature of transplantation of the ovaries and states:

"A study of the literature would indicate that certain facts in regard to ovarian transplantation are quite definitely established.

"1. Homoplastic (from one animal to another of the same species) transplantation is only rarely successful.

"2. Autoplastic transplantation, for a time at least, is usually successful. The onset of the menopause is prevented or delayed.

"3. Even in the autoplastic grafts, degeneration is common after a longer or shorter interval."

Summary of cases. Ovarian tissue was transplanted in 32 patients, 23 of these were Dr. Simpson's cases, and 9 were cases of Dr. Chalfant. The first one occurred on December 30, 1912, and the last one in this series January 27, 1915.

Immediate results. A number of the patients were bad surgical risks on account of long-continued infection or hæmorrhage. But one of the patients died.

Speaking of the graft, he states: "In spite of the fact that many of the sections were taken from the ovaries in intimate contact with pus tubes, in only one instance was the graft infected. In that case (8) two grafts were made because infection was expected. The graft on the right side was infected and

was discharged at about the tenth day. The graft on the left side lived and caused no trouble. In all the others the grafts were palpable at the time the patients left the hospital. In no case was convalescence influenced by the graft. In a few instances there was a little local tenderness for a time."

In speaking of *ultimate results*, he divides his cases into:

1. Those in whom one ovary remains in its natural location;
2. Those from whom both ovaries were removed but the uterus remains;
3. Those from whom the uterus and both ovaries were taken.

In the first group there are thirteen cases. The graft was palpable in nine of these thirteen, the oldest one after one year. In two cases the graft increased in size, and was tender and painful a few days preceding menstruation. Only one patient complained of flashes of heat or other nervous disturbance, and it is probable that in this case the ovary was infected and destroyed.

There were two cases in which both ovaries were removed but the uterus remained. One of these was operated upon on May 22, 1914, and menstruated the first time September 6, 1914, and regularly each month, including February 1915. Flashes of heat were moderately severe just after leaving the hospital, disappeared with the onset of menstruation, and recurred again in March of this year, at the time of her expected period, but were less severe and lasted about three or four weeks. The other patient had not menstruated; menopause symptoms began three months after the operation, and have been quite severe.

There were seventeen cases in the group representing those from which the uterus and both ovaries were removed. Five patients gave evidence of continued function of the graft, if we admit that variations in size and increased tenderness are indications of functional activity as claimed by Tuffier. The first patient gave a very interesting history. The graft seemed to go through a regular cycle of about three months, with a gradual increase in size for one week and with increased local tenderness; for two months the ovarian tissue maintained its size and the patient felt "splendid," was much more energetic and less readily fatigued, and the symptoms of the menopause were much less severe. After two months the graft diminished in size, the tenderness disappeared, the patient became languid and easily fatigued, and the flashes of heat and nervous disturbances were very marked. From May to the latter part of November, 1914, the graft was small, but since that time she has been through one cycle and was just starting another at the time of examination. On several different occasions an irregularity of the graft was detected which corresponded in every physical characteristic to a normal graafian follicle. This has also been noticed in other patients. We are unable to offer any theory to account for this periodicity, but it has been observed by both the patient and her physician. Another one of Chalfant's patients, operated upon September 13, 1913, noticed that the graft varied in size. Of the seventeen patients in this group one died and one had removed and could not be located. In the remaining fifteen the graft was palpable in twelve, and not palpable in three. The graft was tender in six, but in only one was there much discomfort.

In regard to the effect on the menopause, he divides the cases into four classes:

1. Absent.
2. Slight, where the symptoms were not constant, occurring usually at the time of the expected menstruation, and did not cause more than momentary disturbance.
3. Moderate, where the symptoms were more constant and troublesome.
4. Severe, where the symptoms recurred frequently during each day and caused almost constant discomfort.

Two patients (10.8 per cent) had no flashes of heat or nervous disturbances. In 7 (or 41 per cent) the menopause symptoms were slight; in 5 (29.4 per cent) they were moderate; and in 3 (or 17.7 per cent) they were severe.

Simpson and Chalfant, in an effort to have a definite basis for comparison, sent letters to about 150 patients from whom both ovaries and tubes had been removed. The letters

were sent to patients under forty years of age. Forty patients replied, either in person or by letter. Of these forty cases, four (or 10 per cent) had had no flashes of heat or nervous disturbances; seventeen (or 17.5 per cent) had had only slight disturbances; eight (or 20 per cent) described their discomforts as moderately severe; and twenty-one (or 52.5 per cent) as severe.

Comparing these four groups with the graft cases, we have these figures:

Symptoms of the Menopause	Patients with Graft		Patients without Graft	
	Cases	Per cent	Cases	Per cent
None	2	10.8	4	10
Slight	7	41	7	17.5
Moderate	5	29.4	8	20

In regard to these figures, the authors state that while it is clear that the number of observations is too small to draw definite conclusions from, and that while it is possible that the patients who have been uncomfortable after operations are more prone to answer a letter, thus affording themselves an opportunity to make a complaint, still the comparison is interesting at least, and is in accordance with the conclusions of Doctors Martin, McIlroy, and Libroia, to the effect that transplantation lessens the severity of the artificial menopause.

Simpson and Chalfant conclude that —

1. Subcutaneous transplantation of ovarian tissue does not increase risk of operation.

2. In the majority of patients the graft will persist for a time. In this series it is still present at 27 months, 18 months, and in three patients at more than a year.

3. In some patients the graft appears to functionate, as shown by the apparent development of graafian follicles, by the variation in the size of the graft, by tenderness, and, when uterus remains, by menstruation.

4. The presence of one ovary in the pelvis does not necessarily interfere with the success of the graft.

5. Those patients in whom ovarian tissue has been grafted seem to have less discomfort from the premature menopause.

AUTHOR'S CONCLUSIONS

Careful sifting of the accumulated literature of ovarian-tissue transplantation leaves a feeling of disappointment as to its surgical value in the mind of an impartial observer.

Autotransplantation of ovarian tissue, as the operation is at present practiced, retards and modifies the symptoms of the artificial menopause that is precipitated by castration in a definite number of cases, depending undoubtedly upon the ability of the graft to retain its vitality in the new environment.

The percentage of successful results in the autotransplant seems to be as large where the simplest technique is employed, using small pieces of ovaries tucked into pockets of well-vascularized tissue, as when a more complicated technique is employed with an attempt to definitely couple up the blood-vessels.

The fact that homotransplants and heterotransplants are failures, made with the same technique that is employed for successful autotransplants, demonstrates that there is a definite antagonism between the tissues of different individuals of the same species, and a prohibitive antagonism between the tissues of different species.

Occasional reports of successful homotransplants and heterotransplants encourages one to hope that in some way this antagonism of tissue will be overcome, and more successful work may result because of the greater precision this would make possible in selecting more normal tissue.

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SUBCUTANEOUS TRANSPLANTATION OF OVARIAN TISSUE[1]

Report of 32 Cases with Special Reference to the Effect of Such Transplantation on the Menopause

By SIDNEY A. CHALFANT, M.D., Pittsburgh

IT seems to be a generally accepted fact that a part or all of one or both ovaries should be saved whenever possible.

It sometimes happens, however, that either from infection or damaged blood supply it is not safe to leave the ovary in the peritoneal cavity. All surgeons have met with such a dilemma and have wished for a simple solution of the problem.

Dr. Simpson, in 1912, was confronted with the following:

A young woman aged 21 had had, about three years before, a ruptured appendix with general peritonitis. At that time the abdomen was opened and drained. She later had her appendix removed and a third time the abdomen was opened for separation of intestinal and pelvic adhesions. These operations were done by three distinguished surgeons in another city. When first seen by Dr. Simpson she was suffering so greatly that she was a semi-invalid, and at each menstrual period was confined to bed at least a week, suffering intensely. For an entire year operation was refused although repeatedly the father, the mother, and the patient herself, all demanded a radical operation. Every possible effort was made to relieve her suffering both by local and constitutional measures. Finally, after all the other measures had failed, Dr. Simpson consented to operate, provided he would be permitted to transplant some ovarian tissue into the subcutaneous tissue of the abdominal wall. It was explained that this was an effort to prevent or to lessen the severity of the symptoms of the artificial menopause, that it was a relatively new procedure, and that the results were very uncertain. The operation, which was performed on December 30, 1912, consisted in the removal of the uterus, both ovaries and tubes, and the separation of intestinal adhesions. A piece of the better part of one ovary was transplanted into the subcutaneous fat of the abdominal wall, about two inches inside the anterior superior spine of the ilium on the right side. (For a description of the pathology, see Case 1.)

This particular location for the transplantation was chosen for the following reasons:

1. In case of infection or gangrene, the graft could be removed by cutting one or two stitches.

2. In case of later pain the graft could be removed under a local anæsthetic without the necessity of a laparotomy.

3. The blood supply in this region is comparatively good, from the superficial and deep epigastric arteries.

4. Protection is afforded by the anterior superior spine. This is better in a thin patient.

5. If the graft became infected, the abdominal wound would not be involved.

6. This site is easily accessible at the conclusion of the operation.

7. Most important of all, it is free from the dangers of intraperitoneal or retroperitoneal transplantation in those cases in which there is a possibility that the graft is already infected.

TECHNIQUE

After the ovaries were removed, a portion or all of the better one was kept in normal salt solution at body temperature until the operation proper was completed. Then a small incision was made through the skin about two inches inside the anterior superior spinous process of the ilium. A pocket was made in the subcutaneous tissue by spreading a hæmostatic forceps, and into this pocket a section from the cortex of the ovary (about 2x2x½ cm.) was inserted and the skin closed by plain catgut suture. This same technique was followed in all the subsequent cases, except that in some a transplantation was made on both sides.

REVIEW OF THE LITERATURE SINCE 1911

Martin (1) in 1911 reported his personal experience with ovarian transplantation and gave an exhaustive review of the literature and a complete bibliography. His third conclusion is of particular interest to us at this time. "It seems to be established that a small portion of ovary successfully engrafted anywhere furnishes to the subject of the graft the secretion or influence which preserves her sexuality, and prevents atrophy of the genital

[1] Fellowship thesis presented before the American Gynecological Society, White Sulphur Springs, West Virginia, May 15–18, 1915.

organs and other changes in the individual that are coincident with complete castration."

Dr. Louise McIlroy (2) investigated the influence of ovarian secretion; grafted a piece of the cortex of the ovary on to the uterine wall, into the kidney, on to the parietal peritoneum, and into the uterine muscle. She found ultimate degeneration of autoplastic grafts, the rate depending upon the vascularity of the site of implantation, the more vascular, the less rapid, but that atrophy of the uterus and mammæ was prevented by the graft.

In another paper (3) the same writer arguing from these facts states that "the grafts become absorbed in time, but they have served their purpose in assisting the organism to become gradually adapted to the change in metabolism, which occurs when any interference has taken place in the equilibrium maintained by the ductless glands."

A. Libroia (4), experimenting on dogs, made both autoplastic and homoplastic grafts in the subcutaneous tissue, the abdominal muscles, and the spleen. These were examined from four to nine months later. In the autoplastic grafts he found marked degeneration of the ovarian tissue with infiltration by newly formed connective tissue at the earlier date, which progressed to complete disappearance of specific ovarian elements and replacement of the organ with fibrous connective tissue, at the later date. In no case was he able to observe a regeneration of ovarian parenchyma. The homoplastic grafts were uniformly absorbed. Concerning the effect on the uterus and the animal as a whole he states: "It is a fact worthy of note that in the animals in which I have practiced the graft, there has been no noticeable atrophy of the uterus, as should occur in young female dogs with double oöphorectomy, according to the research of Hegar and Sokoloff. I believe that while the ovary remains alive in the organism in which it is grafted — that is, before it completely degenerates — it continues to function through its internal secretion. As the degeneration proceeds slowly and progressively, the internal secretion is slowly and progressively withdrawn, so that the organism habituates itself to this gradual suppression and is not disturbed when, through the complete transformation of all the ovarian elements into connective tissue, this function fails completely."

Higuchi (5) made autoplastic grafts on to the peritoneum of rabbits. In the animals killed after a year the grafted organ was almost completely transformed into connective tissue.

Uffreduzzi (6) using rabbits and guinea pigs investigated the possibility of making a new path to the uterus, when the normal lumen of the tube is obstructed. He transplanted the ovary with and without its blood supply, into the uterine cavity, into the wall of the uterus projecting into the cavity, and into the end of the resected cornu. He also attempted to make an artificial opening in the side of the tube and in the uterine cornu after ligating the fimbriated extremity.

He concludes —

"1. The ovary transplanted into the uterus, or into its wall, is very quickly excluded from the cavity and is not able to ovulate directly into it.

"2. An artificial stoma in the tube or uterine cornu, allowing communication with the peritoneal cavity, cannot be maintained. Sooner or later the wall closes and regenerates, the intestinal loops and parietal peritoneum frequently participating in the closure.

"3. In regard to the graft, the autograft takes constantly and remains vital indefinitely — in one experiment, beyond two years. Almost constantly there is a large increase of interstitial tissue, which may be accompanied by functional insufficiency. The other constituent parts may be considered as normal and without special characteristics."

Kawasoyo (7) working with rabbits investigated the relation between degeneration and blood supply. He concludes —

"1. In the transplanted ovary, even where a good take occurs, certain changes take place such as degeneration and atrophy. These changes are determined by the diminished blood supply.

"2. These changes occur in less degree in the ovary left *in situ*.

"3. It is here noteworthy that wherever possible in extirpation of tumors of the adnexa the whole ovary should be left or a piece of it with the least possible destruction of the afferent blood-vessels."

Jacobs (8) condemns, on account of the danger of subsequent trouble and secondary operations, the conservation of the ovary and the ovarian graft. He cites a case of his own of pregnancy, after double ovariotomy for a fibroid, due to incomplete removal of one ovary and says that he believes "it to be the same in almost all occurrences of pregnancy after bilateral oöphorectomy, except in cases of multiple ovary, which are exceeding rare.

"If we then discard, as an excuse for these serious operations, the possibility of pregnancy, if we may condemn the leaving behind of useless organs after a mutilating operation, we are near to admitting that it is superfluous to wish to combat the dangers of the artificial menopause by illusory and dangerous means which are able to give occasion for further surgical interference."

Tuffier (9) from October, 1906, to October 11, 1911, has performed 130 ovarian grafts. Formerly he kept the graft in the subcutaneous cellular tissue during the operations and took them from there to transplant in the peritoneum near the stump of the uterus or the cervix. Recently, he places them in the subperitoneal connective tissue and leaves them there. He reports the source of the graft and nature of the operation in 119 cases, and the results in 60 cases, seen from 3 months to 3 years after operation. In the majority of cases the single or double autograft was successful in that it persisted and showed a periodic congestion. The heterografts and the cold storage grafts uniformly failed.

In his experience the effect on the menopausal

symptoms depends upon the presence of the uterus. Without menstruation the graft has no effect in preventing these symptoms. When menstruation does recur there is a period of amenorrhœa of 3 to 7 months, with all the symptoms of the menopause, which disappear at once when menstruation occurs. Each menstruation is preceded by a period of congestion of one of the grafts; if two are present never both at the same time. This period of congestion occurs six to eight days before the flow.

In the discussion of Tuffier's paper, Hartmann (10) states that he believes the operation is one to abandon, and that Tuffier's report will be useful in deterring others from engaging in the same line of work. If an ovary is to be preserved it should be left in its normal position.

Tuffier in his later paper (11) reports additional cases and concludes that "ovulation without menstruation is, as I have explained, altogether useless. Improvement in heterografting is the most desirable advance at present. In closing it should be stated that where the uterus is absent, ovarian transplantation is of no value."

Davidson (12) reports three cases of autoplastic transplantation, two of which were successful in that menstruation occurred. He took vertical or horizontal slices from the ovary and transplanted them into the rectus muscle after the peritoneum was closed.

Whitehouse (13) reports one case of autoplastic grafts in which menstruation was at first irregular but at the end of one year seemed to be regularly established. He kept the ovary in the pouch of Douglas during the operation and before the incision was closed the healthy half of the ovary was cut into minute fragments and these were scattered into the subperitoneal connective tissue, and within the rectus muscle and rectus sheath.

De Rouville (14) reports in detail a case of autoplastic transplantation; one ovary under each edge of the abdominal incision, with recurrence of menstruation, metrorrhagia, and later pain and tenderness in the grafts which necessitated their removal after eighteen months. Ovarian tissue was still living with "graafian follicles in process of growth, some follicular cysts, a large hypertrophied corpus luteum in process of degeneration, corpora albincantia, etc." Menstrual and intermenstrual bleeding ceased at once after removal of the grafts.

In a later paper (15) the same author reports eleven cases with results in nine. In only one was the result really favorable from a clinical point of view; in a second it was of debatable value; and in a third favorable but of short duration, From an anatomical viewpoint there appeared to be, except in one case, a more or less rapid atrophic evolution in all the grafts. The patients most favorably influenced appear to be given the benefit of a slow and gradual deprivation of their ovarian glands.

To those who attempt homoplastic transplantation in an effort to overcome sterility, the work of Castle and Phillips (16) is especially interesting. One hundred and forty-one guinea pigs were castrated and each grafted with the ovaries of another guinea pig. One hundred of these were mated with males. Three of them bore young resembling those that would be expected *from* the guinea pig from which the ovary had been removed and not such as would be expected from the foster mother. In 87 cases no ovarian tissue was found postmortem. In 11 cases, in spite of supposed perfect castration, part of the ovary remained. Three of these bore young whose color characteristics indicated that they had come from regenerated ovarian tissue rather than from the graft. This was in all cases confirmed by autopsy.

Guthrie (17) used chickens for his experiments and came to conclusions exactly opposite to those of Castle and Phillips (16).

Varonoff (18) was particularly fortunate in his experiments on sheep. Under local anæsthesia he removed the ovaries of one ewe and put in their place the ovaries of another ewe. In practically every case the ewes bore healthy lambs. These experiments would seem to be open to question as to whether the castration was perfect, as no autopsy reports are given.

Storer (19) reports a case of transplantation of a portion of the remaining ovary into a cavity in the cornu of the uterus, made by dividing the stump of the tube until the uterine cavity was laid open. Sixteen months after operation menstruation ceased and the patient showed all the symptoms of pregnancy. Three and a half months later she expelled, with some hæmorrhage, a mass of detritus and the uterus decreased in size. This seems to have been an abortion of an early pregnancy retained for some time after the death of the fœtus. Unfortunately, no pathological examination seems to have been made.

A study of the literature would indicate that certain facts in regard to ovarian transplantation are quite definitely established.

1. Homoplastic (from one animal to another of the same species) transplantation is only rarely successful.

2. Autoplastic transplantation for a time at least, is usually successful. The onset of the menopause is prevented or delayed.

3. Even in the autoplastic grafts degeneration is common after a longer or shorter interval.

SUMMARY OF CASES

Ovarian tissue was transplanted in 32 patients (23 of Dr. Simpson's and 9 of the writer's), the first one on December 30, 1912, and the last one in this series January 27, 1915.

In every instance it seemed necessary to remove the ovaries, as stated in the detailed

reports, on account of infection, extensive cystic degeneration, damage from extensive adhesions, or impaired blood supply. In practically every instance, the tissue transplanted was abnormal.

IMMEDIATE RESULTS

1. Of the operation:

One patient (Case 29, writer's patient) died at the end of 26 hours from a peritonitis due to the bacillus aërogenes capsulatus.

This was a fibroid with a tubo-ovarian cyst, cystic ovary and intestinal adhesions. Autopsy showed no perforation of the intestines and the infection probably gained access through the intestinal wall which was injured in separation of the adhesions.

Case 1 had a very rapid pulse for three or four days after operation, probably due to a hyperthyroidism.

Case 17 (writer's patient) had a particular stormy convalescence. The second day after operation she developed a tachycardia with pulse of 210. The heart quieted down under digitalis and bromides. About the sixth or seventh day she developed a left-sided pleurisy with effusion, and later on empyema which necessitated resection of a rib. She left the hospital with drainage from the chest, but this later cleared up leaving some thickening of the pleura. This patient has a mild hyperthyroidism which probably accounts for her tachycardia.

A number of the patients were bad surgical risks on account of long-continued infection or hæmorrhage.

2. Of the graft:

In spite of the fact that many of the sections were taken from ovaries in intimate contact with pus-tubes, in only one instance was the graft infected. In that one, Case 8, two grafts were made because infection was expected. The graft on the right side was infected and was discharged at about the tenth day. The graft on the left side lived and caused no trouble.

In all the others the grafts were palpable at the time the patients left the hospital. In no case was convalescence influenced by the graft. In a few instances there was a little local tenderness for a time.

ULTIMATE RESULTS

Function. These patients who have had transplantations are naturally divided into three classes:

1. Those in whom one ovary remains in its natural location;

2. Those from whom both ovaries were removed but the uterus remains;

3. Those from whom the uterus and both ovaries were taken.

1. *Those in whom one ovary remains in its natural location* (13 patients). In all these patients the remaining ovary was not perfectly normal and there was a possibility that it might require removal, or that the internal secretion from it might not be sufficient, so that it was thought wise to conserve as much ovarian tissue as possible.

In the first one of these (Case 3), it was thought at the time of operation, that all of the ovarian tissue had been removed, but later, by examination, what appeared to be the right ovary was found. It was almost of normal size and somewhat cystic. It probably was a piece of the ovary that was torn off in separating the dense adhesions and had since increased in size. In this case the graft was not palpable.

The graft was palpable in 9 of the 13 cases, the oldest one (Case 9), after one year. In two cases (9 and 16), the graft increased in size and was tender and painful a few days preceding menstruation.

Only one patient complained of flashes of heat or other nervous disturbance, and it is probable that in this case the ovary was infected and destroyed.

2. *Those from whom both ovaries were removed but the uterus remains* (2 patients). One patient (Case 16) operated upon May 22, 1914, menstruated the first time September 1, 1914, and regularly each month including February, 1915. Since that time there has been no menstrual flow. Flashes of heat were moderately severe just after leaving the hospital, disappeared with the onset of menstruation, and recurred again in March, at the time of her expected period, but were less severe, and lasted about three or four weeks.

The other patient (Case 17) has not men-

struated. Menopausal symptoms began three months after the operation and have been quite severe.

3. *Those from whom the uterus and both ovaries were taken* (17 patients). Five patients (Cases 1, 6, 8, 9, and 14) give evidence of continued function of the graft, if we admit that variations in size and increased tenderness are indications of functional activity as claimed by Tuffier.

The first patient gives a very interesting history. The graft seemed to go through a regular cycle of about three months. There was a gradual increase in size of the graft for about one week, with increased local tenderness. For two months the ovarian tissue maintained its size and the patient felt "splendid," was much more energetic and less readily fatigued, and the symptoms of the menopause were much less severe.

After two months the graft diminished in size, the tenderness disappeared, the patient became languid and easily fatigued and the flashes of heat and nervous disturbances were very marked. From May to the latter part of November, 1914, the graft was small, but since that time the patient has been through one cycle and was just starting another at the time of examination. On several different occasions an irregulatiry of the graft was detected which corresponded in every physical characteristic to a normal graffian follicle. This has also been noticed in other patients. We are unable to offer any theory to account for this periodicity, but it has been observed repeatedly by both the patient and her physician.

Another patient (Case 6) operated upon September 13, 1913, has noticed that the graft varies in size. She says that it has disappeared for as long as two months at a time and that again it was as large as an orange, but that it has been palpable the greater part of the time. She has had no flashes of heat or nervous disturbance. On April 10, 1915, she noticed for the first time a little bloody discharge lasting only a few hours, which she considered a menstrual flow. She had had a supravaginal hysterectomy.

Of these 17 patients, one died and one had moved and cannot be located. In the remaining 15, the graft was palpable in 12, not palpable in 3. It was tender in 6, but in only one (Case 7), was there much discomfort. This patient has such a very unstable nervous system that it is extremely difficult to reach a true estimate of the severity of her discomforts. Distinct variation in the size of the graft was noticed by three patients.

EFFECT ON THE SYMPTOMS OF THE MENOPAUSE

So far as the menopausal symptoms are concerned, the cases may be divided into four classes: (1) absent; (2) slight, where the symptoms were not constant, occurring usually at the time of the expected menstruation and not causing more than momentary disturbance; (3) moderate, where the symptoms were more constant and troublesome; (4) severe, where the symptoms recurred frequently during each day and caused almost constant discomfort.

Two patients, 10.8 per cent (Cases 2 and 6), had no flashes of heat or nervous disturbances; in 7, or 41 per cent, the menopausal symptoms were slight; in 5, or 29.4 per cent they were moderate; and in 3, or 17.7 per cent they were severe.

Of these 3, one is suspected of having a mild hyperthyroidism. Another surely has this condition. According to Tuffier (11) hyperthyroidism increases the severity of the artificial menopause.

In an effort to have a definite basis for comparison, letters were sent to about 150 patients from whom both ovaries and tubes had been removed. As all our transplantation cases with two exceptions, were 40 years or under, only those of a like age were included. This includes all the patients since January 1, 1905, in Dr. Simpson's service from whom he found it necessary to remove both ovaries, together with a few of the writer's patients. Only 40 patients replied either in person or by letter.

On these 40 cases, 4, or 10 per cent, had no flashes of heat or nervous disturbances; 7, or 17.5 per cent had only slight disturbances; 8, or 20 per cent, described their discomforts as moderately severe; and 21, or 52.5 per cent as severe.

The two series of cases are contrasted in the following table:

Symptoms of the Menopause	Patients with Graft		Patients without Graft	
	Cases	Per cent	Cases	Per cent
None	2	10.8	4	10
Slight	7	41	7	17.5
Moderate	5	29.4	8	20
Severe	3	17.7	21	52.3
Total	17		40	

While it is evident that the number of observations is too small from which to draw definite conclusions, and it is also possible that the patients who have been uncomfortable after operations are more prone to answer a letter, and thus have an opportunity to make a complaint, still the comparison is interesting at least, and is in accordance with the conclusions of Doctors Martin, McIlroy, and Libroia, to the effect that transplantation lessens the severity of the artificial menopause.

CONCLUSIONS

1. Subcutaneous transplantation of ovarian tissue does not increase the risk of the operation.

2. In the majority of patients, the graft will persist for a time. In this series it is still present at 27 months, 16 months, and in 3 cases more than a year.

3. In some patients the graft appears to functionate as shown by the apparent development of graafian follicles, by variation in size, and tenderness, and when the uterus remains, by menstruation.

4. The presence of one ovary in the pelvis does not necessarily interfere with the success of the graft.

5. Those patients in whom ovarian tissue has been grafted seem to have less discomfort from the premature menopause.

REPORT OF CASES

For the sake of brevity, the history, diagnosis, and details of operation, have been omitted. Only the gross pathology is given for the same reason.

CASE 1. Miss B., age 21, referred by Dr. J. P. McKelvy, Pittsburgh, Pennsylvania. Three previous abdominal operations by other surgeons.

Operation, December 30, 1913, by Dr. Simpson: Supravaginal hysterectomy; salpingo-oöphorectomy, bilateral, extensive intestinal and omental adhesions separated; ovarian tissue transplanted.

Pathology. Both tubes closed over by adhesions from previous peritonitis due to ruptured appendix. Right tube closed, convoluted, and adherent to right ovary and posterior surface of broad ligament. Left tube convoluted, not closed, adherent to sigmoid. Both ovaries cystic seat of chronic interstitial inflammation, each about the size of an English walnut. Uterus in fairly normal condition. Omental adhesions to under surface of incision, to bladder, to uterus and adnexa, quite sensitive. These adhesions had drawn the transverse colon almost to the cæcum making a decided angulation.

February 7, 1913, complains of flashes of heat at time of expected menstruation.

Examination, March 10, 1915. Ovarian graft very definitely palpable; a little larger than at the time of operation; slightly tender. This increases in size and stays large for two months, then becomes decidedly smaller and remains small for one month. Patient complains of *severe* nervous disturbance and *severe* flashes of heat during the time the graft is small, and at this time is languid and tires easily. When the graft is large patient is energetic, much less readily fatigued and is troubled only to a slight degree by nervousness and flashes of heat. (Her nervous troubles are probably increased by hyperthyroidism.)

CASE 2. Miss S., age 26 years; referred by Dr. E. M. Davis, Broughton, Pennsylvania. Appendix, right ovary and greater portion of right tube previously removed by another surgeon.

Operation, June 28, 1913, by Dr. Simpson: Supravaginal hysterectomy; left salpingo-oöphorectomy; two pieces of ovarian tissue transplanted.

Pathology. Left ovary almost completely detached by torsion of pedicle and would probably have been free in a short time. Ovary cystic, about one and a half times normal size. Uterus about normal in size, removed on account of fact that patient had been bleeding excessively. Omental adhesions to anterior abdominal wall.

Examination, March 13, 1915. Graft palpable, no tenderness, no variation in size. Has not been troubled in any way by flashes of heat or nervous disturbances.

CASE 3. Mrs. L., age 35; referred by Dr. J. P. McKelvy, Pittsburgh, Pennsylvania. Appendix and both tubes removed by another surgeon nine years before.

Operation, July 5, 1913, by Dr. Simpson: Supravaginal hysterectomy; bilateral oöphorectomy; transplantation of pieces of each ovary.

Pathology. Uterus normal size, densely adherent. Right ovary cystic throughout, size of goose egg. Left ovary cystic throughout, embedded in broad ligament and covered by sigmoid and omental adhesions.

Examination, February 10, 1915. Graft not palpable. *No* flashes of heat or other nervous disturbances. Examination shows part of right ovary remaining in the pelvis, cystic, about size of normal ovary.

CASE 4. Mrs. S., age 39; referred by Dr. George Speicher, Rockwood, Pennsylvania.

Operation, July 9, 1913, by Dr. Simpson: Hysterectomy; salpingo-oöphorectomy, bilateral; small pieces of ovarian tissue transplanted on left side.

Pathology. Bilateral pyosalpinx. Small amount of pus in each tube. Both ovaries cystic. Uterus, both ovaries and tubes adherent.

Examination, March 26, 1915. Graft not palpable. There has been no discomfort at the site of transplant. Flashes of heat began about two months after operation, are *very slight*, and recur about time of the expected menstrual period. Nervous condition is much improved.

CASE 5. Mrs. W., age 20; right tube and ovary previously removed by another surgeon.

Operation, September 16, 1913, by Dr. Simpson: Supravaginal hysterectomy; left salpingo-oöphorectomy; separation of adherent sigmoid from old line of incision; ovarian tissue transplanted.

Pathology. Sigmoid adherent to line of incision of previous operation. Left pyosalpinx containing about one and a half drams of pus. Right ovary cystic throughout. Right ovary and tube adherent. Uterus retroverted and densely adherent. Inflammatory cyst containing about two ounces of fluid on left side.

Patient has moved and cannot be located.

CASE 6. Mrs. F., age 24; referred by Dr. J. H. Repman, Charleroi, Pennsylvania.

Operation, September 27, 1913, by Dr. Simpson: Supravaginal hysterectomy; salpingo-oöphorectomy bilateral; appendectomy; two pieces of ovarian tissue transplanted on right side.

Pathology. Old ruptured ectopic gestation of left side with small quantity of old blood in pelvis. Hydrosalpinx of right side containing about one ounce of fluid. Both ovaries cystic. Extensive intestinal adhesions. Uterus, tubes and ovaries all adherent. Appendix kinked by short meso-appendix and chronically inflamed.

Examination, April 10, 1915, Dr. Repman reports that the graft is palpable, has varied in size and has been as big as an orange. *No* flashes of heat or other nervous disturbance. She has today, for the first time, a slight bloody discharge which she considers menstrual flow. This continued only a few hours.

CASE 7. Mrs. M., age 36; referred by Dr. E. A. Kuhns, Emlenton, Pennsylvania. Right tube and ovary, a part of left tube, and appendix previously removed by Dr. Simpson.

Operation, October 30, 1913, by Dr. Simpson: Supravaginal hysterectomy; left salpingo-oöphorectomy; ovarian tissue transplanted on right side.

Pathology. Chronic metritis and endometritis; left ovary cystic, slightly enlarged.

Examination, March 15, 1915. Graft palpable; decidedly larger than at time of operation. Patient complains of discomfort over transplanted ovary and states that it annoys her all the time. Flashes of heat began shortly after leaving the hospital, of *moderate* severity. Patient thinks she is more nervous than before her operation.

CASE 8. Mrs. J., age 34; referred by Dr. E. Onstott, Saltsburg, Pennsylvania.

Operation, March 23, 1914, by Dr. Simpson: Supravaginal hysterectomy; bilateral salpingo-oöphorectomy; appendectomy; one piece of ovarian tissue transplanted on each side.

Pathology. Multinodular fibroid. Three pedunculated nodules attached to the fundus; two of them about 2½ inches in diameter, one quite small. Tubes and ovaries adherent. Tubes contained a small amount of pus, and ovaries completely cystic. Appendix slightly inflamed by continuity. A small fragment of the left ovary remains in the pelvis.

Examination, March 5, 1915. Graft palpable on the left side. (Right side was infected and was discharged during stay in the hospital.) Patient states that three times since operation lump in left side became larger and tender, lasting two or three days. Last period of enlargement was about three weeks ago. *Slight* flashes of heat, for one month or two, soon after leaving the hospital. Has not been troubled for the last eight months. Examination at this time could detect no trace of ovary in the pelvis.

CASE 9. Miss C., age 23; previous appendectomy and suspension of the uterus by another surgeon.

Operation, March 27, 1914, by Dr. Simpson: Dilatation and curettage; perineorrhaphy; left salpingo-oöphorectomy; ovarian tissue transplanted on right side.

Pathology. Laceration of perineum. Left tube and ovary adherent and covered by adherent sigmoid. Left ovary cystic. Right tube and ovary normal, remain.

Examination, March 11, 1915. Graft palpable. Patient states that slight tenderness exists at times, more marked at the menstrual period, and that she notices a lump at that time which is not present at other times. Menstruation regular and normal. No menopausal symptoms.

CASE 10. Mrs. M. age 33; referred by Dr. E. Davis, Broughton, Pennsylvania.

Operation, March 31, 1914, by Dr. Simpson: Dilatation and curettage; perineorrhaphy; supravaginal hysterectomy; bilateral salpingectomy; right oöphorectomy; appendectomy; transplantation of ovarian tissue.

Pathology. Laceration of perineum. Uterus normal size, adhesions between intestines and posterior surface of uterus. Tubes both adherent and inflamed, and interstitial nodules on both sides. Left ovary cirrhotic. Right ovary shows a little hæmatoma, otherwise normal, remains. Chronic inflammation of the appendix.

Examination, March 8, 1915. Dr. Davis reports that the graft is not palpable. There has been no discomfort at site of transplantation and *no* flashes of heat or other nervous disturbances.

CASE 11. Miss S., age 30; referred by Dr. David Boyce, N. S. Pittsburgh, Pennsylvania.

Operation, April 6, 1914, by Dr. Simpson: Dilatation and curettage re-attachment of the sacro-

uterine ligaments at lower point on the cervix; retroperitoneal shortening of round ligaments; resection of both ovaries; appendectomy; transplantation of ovarian tissue on right side.

Pathology. Retroversion of uterus. Left ovary cirrhotic. Right ovary cystic, size of goose egg. Both tubes normal. Appendix adherent and chronically inflamed.

Examination, September 4, 1914. Dysmenorrhœa has been getting less each month. Uterus normal position. Graft palpable. No further report could be obtained.

CASE 12. Mrs. C., age 37; referred by Dr. R. M. Sands, Pittsburgh, Pennsylvania.

Operation, April 8, 1914, by writer: Dilatation and curettage; trachelorrhaphy, right side; bilateral salpingectomy; left oöphorectomy; appendectomy; transplantation of ovarian tissue.

Pathology. Deep laceration, right side of cervix. Both tubes and ovaries densely adherent. Left ovary decidedly cystic was removed. Right ovary fairly normal, remains. Appendix normal.

Examination, April 2, 1915. Graft palpable; about same size as at time of operation. No local pain or tenderness. Menstruation regular; normal in amount and duration. No symptoms of menopause.

CASE 13. Miss M., age 30; referred by Dr. J. I. Johnston, Pittsburgh, Pennsylvania.

Operation, April 14, 1914, by Dr. Simpson: Supravaginal hysterectomy; right salpingo-öophorectomy; transplantation of ovarian tissue, right side. Patient has had two minor operations for dysmenorrhœa but was not relieved. Pain is very severe requiring morphine each month, and operation was decided upon in order to relieve patient from her pain and to remove the danger of contracting the morphine habit.

Pathology. Uterus small, otherwise normal. Right ovary cystic. Left ovary appears normal. Left tube and ovary remain.

Examination, March 20, 1915. Dr. Johnston reports the graft not palpable. Slight tenderness occasionally at the site of transplantation. No flashes of heat or nervous disturbance.

CASE 14. Mrs. K., age 24; referred by Dr. J. I. McLallen, Wilkinsburg, Pennsylvania. Appendix previously removed by another surgeon.

Operation, April 17, 1914, by Dr. Simpson: Dilatation and curettage; bilateral trachelorrhaphy; separation of omental and intestinal adhesions; right salpingo-oöphorectomy; transplantation of ovarian tissue on right side.

Pathology. Bilateral laceration of cervix. Both ovaries equally cystic. Right one very painful, was removed. Left ovary remains. Omental adhesions to the old scar and sigmoid adherent to left broad ligament.

Examination, March 25, 1915. Graft is palpable and patient states that it varies in size. No tenderness at the present time. No flashes of heat. Much less nervous than before operation.

CASE 15. Mrs. S., age 42; referred by Dr. A. T. Hepler, New Bethlehem, Pennsylvania.

Operation, May 13, 1914, by Dr. Simpson: Dilatation and curettage; perineorrhaphy; corpus luteum expressed from right ovary, cavity closed; left salpingo-oöphorectomy; retroperitoneal shortening of round ligament, right side; appendectomy; ovarian tissue transplanted on right side.

Pathology. Laceration of perineum. Retroversion of uterus. Right ovary cirrhotic contained small corpus luteum cyst. Right tube closed and adherent, outer half taken. Left ovary cystic and adherent. Left tube closed and adherent.

Examination, April 10, 1915. Graft not palpable. No local tenderness. Menstruation regular since operation. Has recently become excessive and prolonged. No symptoms of the menopause.

CASE 16. Mrs. S., age 31; referred by Dr. H. M. Welsh, Leechburg, Pennsylvania.

Operation, May 22, 1914, by Dr. Simpson: Dilatation and curettage; bilateral salpingo-oöphorectomy; appendectomy; transplantation of ovarian tissue on right side.

Pathology. Corpus luteum cysts of both ovaries. Left ovary size of duck egg and intraligamentous. Both tubes closed, adherent, and contained a small amount of fluid. Chronic inflammation of appendix with constriction of middle third.

Examination, April 15, 1915. Graft palpable but quite small. No trace of either ovary in pelvis. Patient states that the graft was about the size of a hickory nut for some time and was a little tender on pressure. Flashes of heat were *moderately* severe and began about five or six weeks after operation. September 1, 1914, patient had her first menstrual flow which was profuse and lasted for one day. Menopausal symptoms stopped just preceding the menstruation. Menstruation recurred regularly each month, lasting two or three days, was not profuse and diminished somewhat in amount at the January and February periods. No intermenstrual bleeding — no dysmenorrhœa. Last menstruation about February 1, 1915. At the time of her expected period in March, flashes of heat occurred, were mild and lasted for three or four weeks. (July 10, 1915, Dr. Welsh reported that since September, 1914, patient has menstruated regularly and normally except the March period.) The patient did not detect any enlargement of the graft preceding menstruation.

CASE 17. Mrs. K., age 30; referred by Dr. B. Almquest, Pittsburgh, Pennsylvania.

Operation, June 8, 1914, by writer: Dilatation and curettage; artificial laceration of the cervix, Pozzi method; bilateral salpingo-oöphorectomy; myomectomy; appendectomy; ovarian tissue transplanted, right side.

Pathology. Marked stenosis of cervical canal (with obstructive dysmenorrhœa). Right ovarian cyst, size of large orange, with torsion of pedicle. Dermoid cyst on the left side, size of goose egg. There was a small piece of normal ovary at the

outer part of this cyst but in separating the dermoid the normal ovarian tissue was deprived entirely of its blood supply. A pedunculated fibroid about one and one-half inches in diameter was attached to fundus of uterus. Appendix, chronically inflamed, a few adhesions about base. During the second day after operation patient developed a tachycardia, with pulse rate of 210. This quieted down under digitalis and bromides. About six or seven days after operation she developed a pleurisy of the left side which went on to effusion and empyema, necessitating resection of a rib. Drainage still continued from the sinus at the time she left the hospital. This has completely closed, leaving some thickening of the pleura.

Examination, March 10, 1915. Graft not palpable. Uterus small and somewhat atrophic. Patient reports that there has been no local tenderness at the site of the graft. Flashes of heat began about three months after operation, recurred frequently each day, were *quite severe* and still continued but slightly less severe. No menstrual flow. Has gained about twenty pounds in weight. Patient has a definite hyperthyroidism which probably accounts for her attack of tachycardia, and also for her severe symptoms of the menopause.

CASE 18. Mrs. P., age 38; referred by Dr. W. P. McCorkle, Sheridan, Pennsylvania.

Operation, June 13, 1914, by Dr. Simpson: Vaginal hysterectomy; left salpingo-oöphorectomy; right salpingectomy; extensive vaginal drainage necessary.

Pathology. Bilateral pyosalpinx with small amount of pus in each tube. Left ovary cystic. Both tubes and ovaries and uterus adherent. Right ovary, fairly normal, remains.

Examination, March 10, 1915. Graft palpable but quite small, not tender. Has been no tenderness at site of the graft. Flashes of heat began February 1, 1915, are *very mild*, and occur only in crowded places and following exertion. Less nervous than before operation.

CASE 19. Mrs. C., age 37; referred by Dr. E. P. Gray, Wilkinsburg, Pennsylvania.

Operation, June 16, 1914, by Dr. Simpson: Dilatation and curettage; perineorrhaphy; salpingo-oöphorectomy, left; ovarian tissue transplanted on right side.

Pathology. Laceration of perineum. Ruptured ectopic on the left side with about one ounce of old blood in peritoneal cavity. Left tube and ovary adherent. Right ovary cystic, size of duck egg, ruptured but was not removed.

Examination, April 9, 1915. Graft palpable but smaller than at time of operation. No local discomforts. No symptoms of the menopause. Menstruation regular since operation.

CASE 20. Mrs. W., age 40.

Operation, July 22, 1914, by writer: Cul-de-sac incised with cautery; supravaginal hysterectomy; salpingo-oöphorectomy, bilateral; appendectomy; ovarian tissue transplanted on both sides.

Pathology. Bilateral pyosalpinx with small amount of pus in each tube. Uterus, both ovaries, and tube densely adherent. Both ovaries cystic. Appendix practically normal.

Examination, March 9, 1915. The grafts are both palpable and slightly tender at times, this is increased by exertion. Flashes of heat began shortly after leaving the hospital, are *moderately severe*, increase under excitement. Less nervous than before operation.

CASE 21. Mrs. S., age 28; referred by Dr. J. Wilson, West Elizabeth, Pennsylvania. Appendix and outer half of right tube previously removed by another surgeon.

Operation, August 5, 1914, by writer: Dilatation and curettage; bilateral trachelorrhaphy; salpingo-oöphorectomy, left; adhesions of right tube to broad ligament, and small intestine to scar of former operation; transplantation of ovarian tissue.

Pathology. Left ovary cystic. Left tube and ovary densely adherent to sigmoid and parietal wall. Right ovary slightly cystic. A few adhesions about right tube. Intestinal adhesions to the appendiceal scar.

Examination, March 22, 1915. The graft is palpable but quite small. No local discomfort. Menstruation irregular as before operation, varying from three to seven weeks. Amount of flow normal. No flashes of heat. Nervous symptoms same as before operation.

CASE 22. Mrs. B., age 33; referred by Dr. J. C. Edgar, Oakmont, and Dr. J. E. Rigg, Wilkinsburg, Pennsylvania.

Operation, September 24, 1914, by writer: Perineorrhaphy; supravaginal hysterectomy; salpingo-oöphorectomy, bilateral; appendectomy; transplantation of ovarian tissue.

Pathology. Marked incomplete laceration of perineum. Uterus retroverted. Bilateral pyosalpinx: small quantity of pus in each tube. Both ovaries cystic. Uterus, and both ovaries and tubes densely adherent. Appendix adherent to right tube and ovary.

April 2, 1915. Dr. Edgar reports that the graft is not palpable. There is no local pain or discomfort. Has been troubled by flashes of heat. These are *slight* and last only for a moment. There have been no disturbances of the nervous system.

CASE 23. Mrs. R., age 40. Left tube and ovary and appendix removed two years before by Dr. Simpson.

Operation, October 2, 1914, by Dr. Simpson. Supravaginal hysterectomy; right salpingo-oöphorectomy; ovarian tissue transplanted on right side:

Pathology. Right pyosalpinx containing small quantity of pus. Right ovary cystic. Right tube and ovary, and uterus adherent.

Examination, March 6, 1915. Graft palpable. No local pain. Flashes of heat began shortly after operation, *very slight* and occur only at intervals. Much less nervous than before operation.

CASE 24. Mrs. M., age 36; referred by Dr. H. E. Clark, Sheraden, Pennsylvania.

Operation, October 26, 1914, by writer: Perineorrhaphy; combined vaginal and abdominal hysterectomy; bilateral salpingo-oöphorectomy; appendectomy; ovarian tissue transplanted on right side.

Pathology. Laceration of perineum. Bilateral laceration of cervix and marked erosion. Uterus large. Both tubes closed and adherent. Both ovaries cystic and adherent. (Patient had been bleeding excessively for a number of months.)

Examination, March 4, 1915. Grafts palpable on both sides. Small irregular lump projecting sharply from graft of left side, size of ordinary graafian follicle. Patient states that on two occasions she has noticed enlargement of the grafts, lasted about one week, with local tenderness. No pain except at that time. Flashes of heat *are slight* and at the present time cause her little trouble. Nervousness slightly increased.

CASE 25. Mrs. B., age 25.

Operation, November 16, 1914, by writer: Supravaginal hysterectomy; salpingo-oöphorectomy, bilateral; appendectomy; transplantation of ovarian tissue.

Pathology. Uterus retroverted and adherent. Tubo-ovarian abscess of the left side, about two ounces. Right pyosalpinx. Right ovary cystic. Large cornual nodules on both sides. Both tubes and ovaries adherent. Appendix adherent, kinked, contained fæcoliths.

Examination, April 1, 1915. Graft palpable but quite small. No local tenderness. Flashes of heat began shortly after operation. Have been *moderately severe*, occurring four or five times a day but cause her little annoyance. No disturbances of the nervous system.

CASE 26. Mrs. Z., age 26. Two vaginal incisions and drainage were done at two different times by other surgeons but failed to cure the condition.

Operation, November 17, 1914, by writer: Cul-de-sac incised with cautery; complete hysterectomy; salpingo-oöphorectomy, bilateral; appendectomy; sigmoid injured in separation of adhesion, closed with catgut sutures; ovarian tissue transplanted on left side.

Pathology. Tubo-ovarian abscess of right side. size of small orange. Left tube adherent and closed, contained a small quantity of pus. Left ovary cystic. Appendix adherent to abscess wall.

Examination, March 6, 1915. Graft palpable. No local tenderness. Flashes of heat *moderately severe*, began shortly after operation. No disturbances of the nervous system.

CASE 27. Mrs. E., age 27.

Operation, November 28, 1914, by Dr. Simpson: Dilatation and curettage; anterior colporrhaphy. trachelorrhaphy; right salpingo-oöphorectomy; ligation of varicose vein in right broad ligament; appendectomy; ovarian tissue transplanted, left side.

Pathology. Cystocele. Incomplete laceration of perineum. Right ovary cystic, seat of constant pain. Right tube practically normal. Varicose vein of the right broad ligament, size of index finger, contained phlebolith. Left tube and ovary normal, remain.

Examination, January 18, 1915. Graft palpable and about same size as at time of transplantation. Menstruation normal. March 2, 1915. Graft palpable but smaller than at previous examination. No local tenderness. Menstruation regular and painless.

CASE 28. Miss H., age 39; referred by Dr. J. C. Ohail, N. S., Pittsburgh, Pennsylvania. Uterus, left tube and ovary, and right tube previously removed by another surgeon.

Operation, December 16, 1914, by Dr. Simpson: Right oöphorectomy; transplantation of ovarian tissue on left side.

Pathology. Right ovary cystic and cirrhotic (removed on account of pain).

Examination, February 16, 1915. Patient has been in hospital until this time, under medical treatment on account of a very marked neurasthenia. During her stay in the hospital has not complained at all of any flashes of heat. On direct questioning states that she is troubled a great deal by hot flashes. Small piece of ovarian tissue palpable—not tender. It would seem that her troubles were *not severe* as she had made no complaint during her stay in the hospital and she was not a type to bear her troubles without complaint.

CASE 29. Mrs. H., age 34.

Operation, December 14, 1914, by writer: Supravaginal hysterectomy; salpingo-oöphorectomy, bilateral; appendectomy; transplantation of ovarian tissue, right side.

Pathology. Several small fibroids in uterine wall. Bilateral pyosalpinx. Ovaries both cystic. Uterus both ovaries and tubes densely adherent in the cul-de-sac and to sigmoid. Patient died at end of twenty-six hours from a peritonitis due to the bacillus aerogenes capsulatus.

CASE 30. Mrs. R., age 39; referred by Dr. S. S. Woodburn, N. S., Pittsburgh, Pennsylvania.

Operation, January 7, 1915, by Dr. Simpson: Bilateral oöphorectomy; ovarian tissue transplanted on both sides.

Pathology. Both ovaries seat of corpus luteum cysts, densely adherent in cul-de-sac.

Examination, April 8, 1915. Graft palpable on left side, but not on right. No local discomfort. Flashes of heat *severe:* began before leaving the hospital, but are not as exhausting as they were at first. Somewhat nervous at times but is of nervous temperament.

CASE 31. Mrs. N., age 45; referred by Dr. F. S. Pershing, Wilkinsburg, Pennsylvania.

Operation, January 12, 1915, by Dr. Simpson: Supravaginal hysterectomy; bilateral salpingo-oöphorectomy; ovarian tissue transplanted, right side.

Pathology. Multinodular uterine fibroid size of grapefruit. Left ovary cystic, two inches in diam-

eter. Blood supply of right ovary was impaired and ovary was removed on that account.

Examination, April 10, 1915. Graft palpable, about same size as at time of transplantation. No local tenderness. Flashes of heat are *very slight* and occur only when tired. No disturbance of the nervous system.

CASE 32. Mrs. A., age 35; referred by Dr. D. W. B. Martin, Pittsburgh, Pennsylvania.

Operation, January 27, 1915, by Dr. Simpson: Perineorrhaphy; right salpingo-oöphorectomy; removal of hæmorrhoids.

Pathology. Marked laceration of perineum. Right ovary cirrhotic and cystic, size of hen's egg, has been very painful. Left tube and ovary normal, remain. Appendix previously removed. Two hæmorrhoids removed by clamp and cautery.

Examination, April 8, 1915. Graft palpable, about original size. No variation in size has been detected by patient. No local discomfort. Menstruation has recurred every five weeks, regularly for this patient. No flashes of heat or nervous disturbances.

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A STUDY OF THE MANAGEMENT OF THE PLACENTAL STAGE OF LABOR

With Special Reference to Retained and Adherent Placenta[1]

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BELIEVING that spontaneous separation of the placenta is the rule, and that disturbance of the normal mechanism of this separation is a result of untimely manipulation of the uterus during the placental stage, we began some two years ago to study the physiology of the third stage of labor to determine: *First*, what is the normal or usual mechanism of placental delivery when the uterus is left absolutely alone? *Second*, are the clinical evidences of placental separation always apparent? *Third*, what is the relative proportion of postpartum hæmorrhage in cases in which the placenta is delivered spontaneously as compared with those bleedings following manual expression? *Fourth*, in what proportion of the cases is the placenta retained beyond the two-hour limit? *Fifth*, how long can the placenta be left *in utero* without danger to the mother, and what are the dangers? And, finally, what is the actual frequency of adhesion of the placenta?

To this end we have studied the placental stage in two thousand deliveries occurring in our service at the Long Island College Hospital. Our routine management of the third stage of labor has been as follows: Immediately upon the delivery of the child the cord is clamped flush with the vulva and the fundus is watched but never manipulated until placental separation has taken place. In periods varying from fifteen minutes to two hours, certain definite clinical changes indicating separation have usually become apparent: namely, the cord descends, the fundus rises and is found in the median line, the shape of the uterus becomes flattened from before backward, and a gush of blood escapes from the vagina; the hæmorrhage then ceases as the uterus retracts. When these clinical evidences of separation are present the patient is asked to bear down, and the placenta escapes from the vulva. When, however, the pressure of her abdominal muscles is insufficient to effect delivery, the uterus is grasped as in the method of Credé, stimulated to contract, the fundus laid down in the abdomen to more nearly coincide with the vaginal axis, according to the suggestion of Lambert, and expression is made in this axis at the acme of contraction. We never attempt expression until after the clinical evidences of separation are definitely apparent; *we use the Credé maneuver only for the expression of the already separated placenta.*

The exceptions to the employment of this routine in our practice have been in operative procedures in mid-pregnancy, or before term, as in the toxæmias of pregnancy or premature separation of the placenta, which have demanded immediate delivery by anterior vaginal hysterotomy or otherwise, and at term in cæsarean section, or when the woman has been subjected to a long operative delivery under anæsthesia and a retraction ring has formed or pituitary extract has been given in the second stage. Under these circumstances we immediately express the placenta with the first pain or remove it manually. In placenta prævia, while we leave the expulsion of the child to the natural forces, the placental delivery is done by expression, or manually, in order to allow for prompt retraction of the uterus, which is always retarded by the partially attached placenta.

This series can be divided into those cases, thirteen hundred and six in number, attended in the out-patient service, in which Nature's processes of separation and expulsion and uterine retraction were allowed full play, and six hundred and ninety-four occurring in the in-service, which include all operative cases whatsoever the cause, in which there were forty-four deliveries by forceps, eleven by craniotomy, twenty-three by version,

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three by pubiotomy, twenty-nine by cæsarean section, and thirty-four by vaginal hysterotomy.

The normal mechanism of placental delivery, namely, separation, expulsion, uterine retraction, with expulsion of the placenta by its fœtal surface downward, the cord leading the way, was observed and noted in all of the cases in which there was no uterine manipulation, and the clinical evidences of separation already referred to were constantly present. In other words, the delivery of the placenta followed very closely the Schultze mechanism in all cases in which there was no uterine manipulation.

In the thirteen hundred and six cases attended in the out-patient service by the students and residents no case of post-partum hæmorrhage occurred. Among the six hundred and ninety-four in-door patients, which include all operative procedures, bleeding occurred but three times, though only two cases required tamponade of the uterus — one an anterior vaginal hysterotomy, the other following the delivery of a twin pregnancy.

This record of freedom from post-partum hæmorrhage is in marked contrast to our statistical study in a previous series when it was routine practice to manipulate the fundus immediately on delivery of the child.

There were five placentæ retained for more than two hours. Three of these were delivered by Credé expression under surgical anæsthesia. All had separated and had presented the clinical signs of separation, but were retained in the dilated lower segment of the uterus. One remained detached in the cornu for thirty hours owing to a large myoma located in the body of the uterus which acted as a ball-valve obstruction. Expression in this case even under surgical anæsthesia proved futile, and rather than go through a lacerated and infected vaginal area an abdominal hysterotomy and myomectomy was done and the placenta removed manually. *This placenta was not properly adherent, but mechanically retained.* In the fifth case the placenta was retained for ninety-six hours before separation occurred and expression was resorted to. The retention was due to the retraction of the lower segment following the use of pituitrin which relaxed under surgical anæsthesia and permitted expression. In none of the retained cases was there any amount of vaginal hæmorrhage, confirming Ahlfeld's contention that *an attached placenta, or a completely detached placenta, prevented hæmorrhage from the placental site.* In the latter case the placenta acts as an intra-uterine tampon.

The dangers to which the mother is exposed in retention of the placenta are sepsis and hæmorrhage, and I believe we are right in contending that hæmorrhage is negligible while the placenta is attached or detached, and that sepsis is dependent *wholly upon intra-uterine manipulation through infected passages*, and not upon the retention of the products of conception. In support of this last statement I would call attention to a report before the last International Congress in London in which we recorded the retention and spontaneous expulsion of the products of conception is twenty infected abortion cases, with no mortality.

One placenta accreta is recorded. This was proved, by microscopic section, to be adhesive. In this case, owing to infection (the patient having been handled before entering the hospital), a hysterectomy was done and the patient recovered. This afforded us an opportunity to study the tissue changes which actually occur in adherent placenta.

Statistics show that ten per cent of the patients with adherent placenta which have been removed manually, die of sepsis. This is entirely in accord with the writer's previous experience. But aseptic conservatism and practical radicalism have changed the results in this clinic.

Ordinarily, after the child has been delivered, uterine contraction causes such a sudden diminution in the surface area of the placental site that the separation is unavoidable; for the attached placenta follows the contraction of the placental site until the villi are approximated, the lacunæ are obliterated, and the placenta, becoming a solid mass, cannot follow further contraction, so springs off at its central portion. This first break in continuity allows a little blood to escape between the uterus and placenta,

and the next uterine contraction forces this blood, like a fluid wedge, between the layers of the decidua serotina, separating the placenta in a smooth manner. This accumulation of retroplacental blood is added to during each period of relaxation and spreads out with each contraction, thus separating more and more of the placenta from its central portion toward the periphery. This blood is retained normally behind the placenta owing to the firm attachment of the membranes where they are deflected from the placenta to the uterine walls. The placental circumference is the most firmly attached portion because of this peripheral attachment; and unless the uterus is manipulated and the blood forced through at some point in this circumferential adhesion, the normal mechanism of separation obtains. Retraction of the uterine muscle closes the sinuses in the placental site, the muscle-bundles crowd closer together, the several layers slide over each other, and so bend and twist the sinuses on themselves as to choke the blood current, and so check hæmorrhage. Normal contraction and retraction always coöperate, and, together with the retraction of the irregularly torn vessels and the increased coagulability of the blood, do the actual work of uterine hæmostasis.

The placenta thus separated, unless it be located in the lower segment of the uterus, and our experiences show that the majority are attached high in the body of the uterus must necessarily be delivered by its fœtal surface, with the cord coming first, more or less simulating the method of expulsion described by Schultze. Nature has further fortified the healthy woman against loss of blood attendant upon normal expulsion of the placenta, by an overproduction of blood during pregnancy; the total quantity of blood is actually increased, the fibrin is greater in amount, and a leucocytosis is present during labor. It is therefore difficult, after studying the provisions and safeguards with which Nature has fortified a woman against loss of blood during labor, to see how the normal processes can be improved upon. And we believe with Ahlfeld that the *physiological separation of the placenta is hastened if the uterus is not handled after delivery*, and, further, that active intervention, as *uterine manipulation, favors retention of the placenta and membranes by interfering with those physiological processes.* Manipulation tends to force the retroplacental blood before it has had time to collect, and completely separate the placenta, through the attachment of the membrane at some point in the placental circumference, and thus ends Nature's process. This produces partial detachment of the placenta with incomplete retraction and contraction of the placental site. *Incomplete separation and incomplete retraction* allow uterine bleeding, for it is admitted by all authorities that when the placenta is situated, as it usually is, in the upper segment of the uterus, there can be no apparent vaginal hæmorrhage until separation takes place. Our experience convinces us that premature efforts with the Credé maneuver before the clinical evidences of separation are apparent disturbs the normal mechanism.

There seems to be a confusion in the minds of practitioners between adhesion of the placenta and retention. These are distinct entities. Retention, as has been shown, occurs with varying frequency, depending upon how closely the physiological changes of the placental stage are observed. The placenta is frequently retained in the dilated lower segment of the uterus and cervix after it has been detached from its original site. Adhesion, on the other hand, is extremely rare, occurring in but one of the two thousand cases studied. In adhesion there is a penetration of the myometrium by the chorionic villi, the villi burrowing down into and between the muscle-fibers, intimately attaching the two structures, and small round tissue cells are deposited in the intermuscular spaces, substituting fibrous for muscle tissue — *the meshy layer is wanting or anomalous*, making the placenta part of the uterine wall.

From the foregoing study we would make the following deductions as to the management of the placental stage and the treatment of adherent placenta:

1. That the placenta will separate spontaneously if the normal mechanism is allowed to obtain.

2. That any manipulation of the uterus before the clinical evidences of separation are apparent disturbs this normal mechanism.

3. That post-partum hæmorrhage is best guarded against by the observance of the physiological processes, and that partial detachment, the result of manipulation, predisposes to bleeding.

4. That the normal mechanism of placental delivery is that described by Schultze.

5. That the Duncan mechanism of expulsion only occurs in low implantations of the placenta and where manipulation has been untimely and vigorous.

6. That the placenta may be retained in the uterus for hours or days without danger to the patient, provided it is attached or completely detached, which insures that the bleeding will be negligible.

7. That sepsis is dependent upon the penetration of the uterus by the hand or instrument through infected passages, and not upon the retention of the placenta.

8. That manual extraction *is only admissible in partial separation with hæmorrhage.*

9. That in retention of the placenta without hæmorrhage the cord should be cut off close to the cervix and the case watched until the signs of separation are apparent, when the placenta may be expressed by Credé while the patient is under surgical anæsthesia.

10. That invasion of the uterus via the vagina is fraught with danger from infection; and on exploration, should the placenta not be found presenting at the internal os, infrapelvic delivery should be abandoned and delivery accomplished through sterile avenues by suprapubic extraperitoneal hysterotomy.

11. When the adhesion is so great that its removal entails the *digging out, piecemeal,* of the placenta, excision of the placental site or hysterectomy should be our choice.

HAIR BALLS, OR HAIR CASTS, OF THE STOMACH AND GASTRO-INTESTINAL TRACT[1]

With Special Reference to Their Pre-operative Diagnosis by Radiographic Methods of Investigation, and a Report of a Large Hair Cast of the Stomach Successfully Removed By Gastrotomy

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THE presence in the human stomach of a hair ball, hair cast, trichobezoar or phytotrichobezoar (when vegetable fibers are mixed with the hair), or egaropiles ("sheep's wool")— as these masses have been variously termed — though infrequent, has ceased to be a very rare condition, over 73 cases having appeared in the literature since M. Baudamant (1) reported the first specimen of this kind in the *Journal de Médecine*, Paris, in 1779.

My colleague, Dr. W. W. Butterworth (2), in a most interesting and valuable paper contributed to the pediatric section of the American Medical Association in 1909, was able to compile and analyze a total of 42 cases, including one personal observation, which, after a thorough bibliographic research, he was able to find in the literature up to that year.

Dr. G. A. Moore (3), of Boston, in reporting an interesting case of hair cast in the stomach in the *Boston Medical and Surgical Journal* for January 1, 1914, after a fairly extensive search, found 53 cases mentioned in the literature.

The latest contribution by Dr. Ledra-Heazlitt (4), of Auburn, N. Y., which appeared in the *Journal of the American Medical Association* of January 10, 1914, increases the list to 70 reported cases. These reports include hair tumors throughout the gastro-intestinal tract found on necropsy as well as by operation. Desiring to isolate the cases discovered by operation, Dr. Heazlitt, in reviewing the literature, has collected 41 cases. If to these we add a second case reported by C. Thurston Holland (5), of Liverpool, and a case successfully operated on by Treplin (6), as well as the present instance (all reported in the course of the current year) there would be at least 73 reported cases, of which 44 have been operated upon since Schoenborn (7) first removed a tumor of this kind by operation, in 1883.[2]

Of these, 38 cases were gastrotomies for hair balls which, in several cases — as in our own — were prolonged into the duodenum; 4 were enterotomies, or intestinal resections, in which one or more hair balls were found in the small intestines, chiefly the ileum; while in two others, both gastrotomy and enterotomy were performed on the same patient for separate hair tumors — the operation having been performed at different times in both instances (Heazlitt, 4).

The habit of hair swallowing appears to be practically confined to females. Of the 44 operated cases, all occurred in either girls or young women, except one, the youngest being six years of age (Treplin's [6] case, 1914), and

[2] Since the reading of this paper on December 15, 1914, Dr. W. C. Carroll (8), of Rochester, Minn. (*Journal-Lancet*, January 15, 1915), has reported an additional successful case operated on by Dr. Charles H. Mayo, in which the existence of a gastric hair ball was revealed in the course of an exploratory operation to clear up an obscure diagnosis of abdominal tumor. A hair ball was considered as one of the possibilities, but no X-ray examination was made. The patient was a girl, aged ten years. The operation was performed June 11, 1914. The hair cast weighed 2 pounds, and measured 12 x 25 x 7 cm. The patient made an uneventful recovery. The operation was mentioned by Dr. Mayo in the discussion of this paper. He also referred to a successful gastrotomy for hair ball which had been reported by Dr. Ekehorn, of Upsala, Sweden, in which the pre-operative diagnosis with X-rays had been made. I gathered from Dr. Mayo's remarks that the patient had been exhibited to him and other American surgeons who were visiting the Upsala clinics in the summer of 1914.

Dr. Walton Martin (9), of New York, presented a woman, aged twenty-four years, at the meeting of the New York Surgical Society, April 22, 1914 (*Annals of Surgery*, 1914, lx, 764), from whose stomach he had successfully removed (a few weeks previously) a large hair cast. The pre-operative diagnosis of hair cast was made by the radiologist, Dr. LeWald, the fluoroscopic image being similar in every way to that described by Dr. Thurston Holland (5), whose method and interpretations are frequently quoted in this text. The patient admitted the hair-eating habit.

Dr. Martin's case would be the eighth recorded in which the diagnosis of hair ball in the stomach has been made by a preliminary X-ray examination: Kampmann, 1911 (10); Hüttenbach, 1912 (11); Ramsbottom and Barclay, 1913 (12); Holland, 1914 (5); K. Schwartz, 1913 (13); Francke-Lehmann, 1914 (14); Ekehorn, 1914; Martin and LeWald, 1914 (9).

If we add the cases reported by Mayo, Ekehorn, and Martin, to those mentioned in the text, there would be a total of 76 reported cases of gastro-intestinal hair balls or casts, of which 47 have been operated on, with 2 deaths, or a little over 4 per cent, including in this 2 enterotomies. It is probable that if a careful canvass were made among the surgeons of the day, many unreported cases would come to light, which would swell the statistics very considerably.

[1] Read before the Southern Surgical and Gynecological Association, Asheville, North Carolina, December 15, 1914.

the oldest, a man, aged fifty-two years (Koogken's [15] case, 1883). In most instances (75 per cent, Butterworth, 2) where a history was obtainable the habit had existed from early childhood and had continued over a period of several years. "Once it had existed thirteen years (Schulten's [16] case); in another, fifteen (Best's, 17); seventeen in a third case (Russell, 18), and twenty-two years in a fourth (May, 19)." In our own case the habit had probably existed for fourteen years. The greater number have preferred their own hair, either pulling it out and swallowing it, or chewing the ends of the braids or curls; but occasionally swallowing, in addition, such articles as bits of string, cotton, wool, etc., which have formed a nucleus for the hair tumor. In only two instances (Heazlitt, 4) has hair from a foreign source been removed. One patient a woman spinner of cow's hair, was in the habit of moistening her fingers with the tongue, and thus swallowed enough to form a spherical hair ball in the stomach, weighing about four ounces. The other patient, a woman, aged thirty-seven years, a brush-maker by trade, ate the bristles used in making the brushes, and the hair tumor was composed of this material.

In the majority of the cases it is not clear why the perverted habit leading to hair eating existed. One who is familiar with the pica or bulimia or earth and clay eating which is so common a feature in the history of infantile uncinariasis, is surprised that hair balls are not more frequent in the hookworm infested districts of the South and the Tropics; but evidently the appetite for dirt or earth of the hookworm victim does not extend to hair. In fact, as Butterworth (2) remarks, it is not noted that the presence of intestinal parasites has played an important part in its etiology, for he could find only two such instances, his patient, a girl, aged eight years, a native of Mississippi, who succumbed to the effects of a large hair ball, combined with those of chronic uncinariasis, before any operation could be performed for her relief, and one of Quain's (20) of London, presumably a helminthiasis, not of the hookworm variety, however. A third is the subject of the present observation, a native of Alabama, who for years had been the typical victim of the hookworm disease. Contrary to general belief, insanity or mental derangement does not appear to play an important part in the causation of the habit; in fact, only 4 patients in a list of 73 gastric hair balls, appear to have been insane and in these, with one exception, other substances besides hair, such as nails, tacks, leaves, cocoanut fiber, and twine, were the chief components of the gastric bezoars. It is probable, as Butterworth (2) justly remarks, that the custom of young girls wearing their hair long, loose, and flowing over the shoulders, is an important factor in favoring the establishment of the practice of biting the hair, or passing strands through the mouth or between the teeth. This is most likely the reason why a hair bolus is practically confined to the female sex, and accounts for its greater frequency at an age corresponding to the period of a girl's life when her hair is worn long and loose. Biting hair and swallowing it is, in this respect, analogous to the habit of biting the finger nails, which is common to both sexes in the early childhood and adolescence; the hair eating preponderating in women solely because of the greater opportunity and temptation offered by the long hair of the girl.

The most frequent situation of these hair balls is in the stomach. It is relatively rare for these to be found in the bowel. In only 6 of the 44 operated cases were hair balls found in the intestinal tract (Heazlitt, 4). The tumor usually consists of a large accumulation of hair of varying length, firmly matted into a hard mass, which often completely fills the cavity of the stomach and is shaped by its walls into an exact cast of the organ. The general contour of the hair ball of the stomach, when fully developed, corresponds to the shape of the letter J, thus reproducing the normal stomach outline as disclosed by the fluoroscope or radiograph. The hair masses may occasionally be multiplied or joined by faceted surfaces. "In animals, it is not unusual to find a number of hair tumors at the same time in the stomach." One writer, quoted by Nathan Jacobson (21),

speaks of as many as 9. Holland's (5) second case, illustrated in this article, shows three distinct divisions in the X-ray picture. These are so molded to each other that together they formed a perfect cast of the stomach. They are not infrequently prolonged, as in the present case, by processes that extend into the duodenum or, more rarely, into the esophagus. In only 1 case (Gemmel's, [22], 1894) was a hair ball localized exclusively in the œsophagus, a part of which projected into the stomach. This was an insane man, aged forty-three years, in whom a gastrotomy revealed the presence of 192 nails, pieces of screw, a brass wire, carpet tack, several small pieces of stick, and the above mentioned hair ball which was removed from the œsophagus. Just why more tufts of hair, which must be ingested in small quantities at a time, do not pass through the bowel, is not always clear. One assumption is, that the individual bits of hair reaching the stomach are caught in the mucous folds and thus retained, and that subsequent additions gradually attach themselves to the primary nucleus in the formation of the mass. The movements of the stomach of the carnivorous animals have been recently more thoroughly studied with the help of X-rays. Dr. Cannon (23) administered different quantities of bismuth with food and, after giving it to a cat, made a series of X-ray pictures of the stomach while the process of digestion proceeded. It appears that the food is crowded onward from the cardiac to the pyloric end by rapidly recurring peristaltic waves, and that the stomach contents when filling this organ, are compressed by its muscular contraction and perfectly molded to conform with the interior of this organ. And so we must assume that when a foreign substance, like hair, steadily accumulates and ultimately fills the stomach it is similarly acted upon and receives the imprint of the contracted organ. Instead of a "hair ball," we have, therefore, a "hair cast" of the stomach (Jacobson, 21).

Hair balls and hair casts of the stomach often attain large proportions. According to Butterworth (2), one of the smallest (Pell-Ilderton's, 24) weighed, dry, two and a quarter ounces, or about one-third of its original weight. Several were over two pounds, as in our case. O'Hara's (25), Baudamant's (1), Dandois' (26), and Swain's (27) weighed five pounds three ounces, while Mermet de Hautveille's (28) is reported to have weighed about six pounds, which after nineteen days of desiccation weighed two and one-half pounds.

The clinical history of these patients is fairly well illustrated by the subject of the present observation. It is remarkable, as Butterworth (2) states, how little the general health suffers, considering the duration of the habit. Eventually the limit of toleration is reached, and nature protests. "Pain is a fairly constant symptom; vomiting, at some time or another, is usual, and yet, considering the spongelike and absorbent character of the hair cast it need occasion no wonder if vomiting does not occur. This is readily understood when we realize how ineffectual must be the effort of the stomach to empty itself, when it is literally filled with a mass which is not only molded to its walls, but is itself an effective obturator or plug applied to the œsophageal opening. Hæmatemesis is comparatively rare, while dyspepsia and abdominal tumor are usually the earliest symptoms. It is rather surprising that ulceration is not reported more frequently.

According to Wölfler and Leiblin (29) in their monograph on foreign bodies in the gastro-intestinal tract (1909), only 5 cases of hair ball in the stomach, causing ulceration of this organ, have been reported. Butterworth (2) and Clairmont (30), have each added one case, making in all, as far as I know, 7 cases. Of these, 6, including Butterworth's (2) case, ended in perforation and death. The ulcer, in all of these, occupied the greater curvature; only in the seventh case (Clairmont's, 30) was the lesser curvature the seat of the ulceration. This operator, after removing the hair ball from a girl, aged eight years, found it necessary to resect a large ulcer of the lesser curvature by a gastrectomy which involved one-third of the stomach. The patient made an uninterrupted recovery.

"Alternating attacks of constipation and

diarrhœa are the usual rule. Eventually the breath becomes exceedingly offensive; anæmia grows more pronounced, ingestion of food more difficult, emaciation and exhaustion more noticeable and, unless surgical measures are instituted, with rare exception death occurs from inanition or perforation."

The history of these tumors only illustrates the extreme tolerance of the stomach to foreign bodies and its wonderful adaptability to the most disturbing mechanical obstacles in the normal exercise of its function.

The operative treatment of these hair masses in the stomach has contributed one of the most brilliant chapters to the history of gastric surgery. In 38 gastrotomies reported, not a single fatality has occurred. Only 2 cases in the series of 41 operative cases died, including enterostomy (Heazlitt, 4), and these fatalities occurred when the operations were performed on nearly moribund children suffering from advanced obstruction due to hair accumulations in the ileum. (See last paragraph of footnote, first page of article.

The technique of the gastrotomy for the removal of hair ball does not differ essentially from that which is applied for the removal of foreign bodies from the stomach in general, with the exception that the incisions required on the anterior surface of the organ, midway between the lesser and the greater curvature, are often of unusual length, in order to dislodge and extract the enormous mass without traumatizing the stomach wall unnecessarily. More than usual care is also required in the intraperitoneal exclusion of the cavity, as it is often impossible to deliver the enormously enlarged stomach and extraperitonealize it to insure the most perfect asepsis. These masses are usually so foul and putrid, as the result of long-standing fermentation and decomposition of the hair masses, which are mixed intimately with the residue of food of all kinds, that great care is required to prevent the contamination of the peritoneum and abdominal walls with the drippings from the thick, slimy ooze that covers them. The odor emanating from these masses is so putrid and malodorous that even after weeks of immersion in preservative solutions of formalin and other antiseptics the nauseating odor still clings to them as is well illustrated in the present case. However it is evident that, by the ordinary exercise of caution, in the hands of experienced surgeons, the risk of contamination and peritonitis has been successfully met, as shown by the uniform success and freedom from mortality which has attended the operations thus far recorded.

The indications and success of the surgical treatment of this condition having been clearly and firmly established the chief interest in the clinical study of these cases lies in the pre-operative diagnosis.

THE PRE-OPERATIVE DIAGNOSIS

It is to this feature of the subject that I wish to direct special attention. From this point of view the mere presentation and exhibition of these cases in medical societies is profitable, as the description of an actual occurrence and the exhibition of such a striking specimen as the one here shown will be of benefit in reminding a puzzled diagnostician of one of the possibilities he might have overlooked in the analysis of a doubtful and problematic case. The obscurity of the diagnosis in gastro-enteric trichobezoars is well attested by the fact that of the 47 cases in which an operation was performed in only 10 was a correct diagnosis made before operation. In the majority of cases, simple exploratory laparotomies were performed for tumors of admittedly unknown origin. In others, various conditions were suspected, such as floating kidney, movable spleen, omental tumors or hydatid cysts, tuberculous peritonitis, or malignant growths of the stomach. In one case the hair tumor was supposed to be a twin pregnancy. Until the advent of systematic X-ray examinations the nearest approach to a pre-operative diagnosis has been a gastric tumor. The history and antecedents are often useless, as the patients for the most part, fail to describe their habits or deny them altogether. Even when the suggestion of hair swallowing is offered, it is indignantly repudiated. It is only when confronted with the corpus delicti itself, after the operation, that the patient will admit the habit. The first to record a positive diagnosis prior to operation, accord-

Fig. 1. Photograph of hair cast removed from the stomach of Miss M. B., by gastrostomy, on May 22, 1914 (Dr. Matas' case). Weight of dry specimen: 2 pounds ¾ ounce (about 967 grams); greatest length along greater curvature, 18 inches (46 cm.); along lesser curvature, 9 inches (23 cm.); greatest circumference at fundus, 10¾ inches; (21 cm.); at terminal part, duodenal end, 6⅝ inches (17 cm.). All measurements were taken from the dry specimen.

ing to Wölfler and Leiblin (29), was Stelzner (31), in 1886, who diagnosed a hair ball in the stomach, in spite of the patient's denial, because the tumor could be moved to and fro like a billiard ball in the dilated stomach. But, even with this evidence before him, Stelzner (31) would probably not have been certain of his diagnosis had he not had Schoenborn's (7) case in mind, which had been previously reported in *Langenbeck's Archiv*, 1883. Paton (32), in 1902, made the second correct diagnosis on the information that the girl was known to be a hair swallower and had already vomited a hair ball; also in Ranzi's (33) in 1904, the pre-operative diagnosis of hair ball was stated as very probable, and likewise in Harvie's (34) case in 1908, because the child had been in the habit of swallowing hair and woolen thread. A correct diagnosis was also suggested to Scott Turner (35) after a hair tumor had been removed some weeks previously from the bowel of the same patient. As far back as 1886, Knowsley Thornton (36) came very near the truth in assuming that the transverse colon was the seat of a hair ball in his patient, because it had been noticed that hairs were passed in the stools, and gastric symptoms were absent. At the time of the operation, however, the hair ball was discovered in the stomach. Before the hairs were discovered in the stools, the tumor was regarded as a fæcal mass. In the vast majority of the earlier cases, the tumor was only recognized at necropsy or at operations performed under a mistaken diagnosis.

In many cases the physical signs alone, in view of the slight gastric disturbance, must furnish the basis for the diagnosis. It should be remembered that hair balls are limited and usually well defined, hard, painless tumors, situated in the upper abdomen, where they assume different forms according to their stage of development, and are, therefore, variously described as gourd-like, cucumber-shaped, sausage-shaped, J-shaped, oblong or spherical masses. They are scarcely, if at all, tender on palpation. The tumor is also characterized by considerable mobility, often in all directions but especially toward the left costal arch.

In the cases in which the tumor does not fill the stomach the relation of the mass to the gastric wall, after insufflation with air, is important. In this way the tumor can be shown to lie *in* the stomach. On palpation the tumor can be felt and separated by a layer of air from the abdominal wall. Gastric lavage, in cases which do not fill the stomach completely, may bring out strands or pieces of hair in the washings; but all these signs are very uncertain and, unless the suggestion is offered by a previous history of hair swallowing (trichophagia), the diagnostician is likely to overlook the real nature of the gastric mass.

The radiologic diagnosis. It is only very recently, and since the röntgen rays and fluoroscope have been so advantageously utilized in the study of gastro-enteric diseases, that a great step forward has been made in the diagnosis of hair balls, as well as of other foreign bodies in the stomach. A number of recent writers have directed attention to the

value of X-rays and fluoroscopic examinations in cases of hair balls. Notable among these contributions are the case reports of Kampmann (10), Hüttenbach (11), Clairmont and Handek (30), Schwartz (13), Francke (14), Ramsbottom (12), T. Hausmann (37), and, especially, of C. Thurston Holland (5).

Kampmann (10) in 1911 reports the case of a girl, aged ten years, in whose gastric region a smooth rounded tumor, the width of a hand, not tender on pressure, could be palpated. The mass could be displaced upward and laterally, and could be outlined by percussion upon the nipple line from the upper to the lower gastric region. The history, with the presence of hair in the stools, pointed to the diagnosis of trichobezoar; but Kampmann emphasizes the advantages of the X-ray examination, after the preliminary administration of a bismuth meal, which, in this case, rendered the tumor distinctly visible as an *intra*gastric mass.

Hüttenbach (11) in 1912 reports a case in which a large mass was observed below the xiphoid cartilage, which was visibly displaced up and down on respiration, at the site of the tumor, causing a distinct protuberance on the abdominal wall. The mass could be readily palpated, extending from the left to the right hypochondrium. The tumor had the shape of a greatly enlarged stomach, although the lower boundary did not present a uniformly convex surface. Radiography on an empty stomach furnished little diagnostic information, as no sharp shadow contrasts appeared in the abdomen; but a radiograph taken after a "contrast meal" showed dark shadow lines which outlined the contour of a lighter mass in the center of an enormously dilated stomach. The "magenblase" or upper air space of the stomach was entirely absent. The author concludes that the radiographic or fluoroscopic examination of the stomach *after* the administration of a bismuth or other contrast meal is the decisive element in the diagnosis of trichobezoar.

The radiographic diagnosis of hair balls is made the subject of a special discussion by Clairmont and Handek (30) in 1911 in a paper in which they reported such a case. A smooth, thick, resisting mass, having the

Fig. 2. Retouched radiograph of Miss M. B.[7] (Dr. Matas' case). Hair cast in the stomach showing Holland's characteristic "J"-shaped shadow occupying the entire gastric area enclosed within the gas-distended loop of the transverse colon. No contrast meal. Exposure two seconds with screen. (From the X-Ray laboratory of the Touro Infirmary, New Orleans.)

configuration of the stomach and slightly sensitive to pressure, could be palpated in the patient's left hypochondrium. The tumor was freely movable, had a rounded contour under the left costal arch, which tapered outward toward the pylorus. In the fluoroscopic examination, with the patient in the upright position, the tumor in the gastric region, which was movable, could be displaced upward until it obliterated the upper air space of the stomach (magenblase), where it formed a dense shadow which somewhat resembled a kidney. The "contrast meal" did not penetrate into the stomach in the usual way, but entered very gradually spreading along the lesser curvature; it then diffused itself in a much larger streak along the fundus and greater curvature, in this way outlining a large central mass, which was evidently

detached and separated from the gastric wall. The diagnosis of the gastric tumor was arrived at by the evident presence of a mass which nearly filled the stomach space, and the diagnosis was further advanced to an *intra*gastric foreign body on account of the unusual mobility of the tumor, which could be pushed out by palpation from the greater curvature to the cardiac extremity, where its upper end was made visible against the clear air space.

K. Schwartz (13) in 1913 reports the removal of a hair ball from a girl, aged seventeen years. The mass weighed 941 grams. In this case the examination of the stools for hair proved positive. The X-ray examination was difficult, because the patient was nauseated after the first barium dose and refused further doses. Nevertheless, the few doses swallowed were sufficient to obtain with great distinctness the following picture: the greater curvature of the stomach, which corresponded entirely with the visible and palpable lower boundary of the tumor, was sharply outlined by the dark shadow contours caused by the opaque meal. The pre-operative diagnosis of hair ball was fully confirmed by the operation.

Another patient was operated upon by Francke (14) in 1912, and was presented by Lehmann to the Röntgen Congress of 1914. In this case a hard, round, painless tumor was detected in the gastric region. The radiograph showed an uneven, spotted, lighter area, which filled nearly the entire stomach, and was especially well outlined above a distinctly visible arch. On the basis of the clinical history, combined with the radiographic findings, a probable diagnosis of hair ball in the stomach was made, which was fully confirmed by the operation.

T. Hausmann (37) in 1914, describes a hair ball of the stomach in a girl, aged fifteen years. At the time of the X-ray examination a peculiar behavior of the gastric shadow was noted. It appeared diffusely blurred, a dense, dark streak being seen only along the sharply outlined greater curvature of the stomach. This blurred portion corresponded to the hair ball, in the meshes of which bismuth had become imbedded; the dark portion was the free marginal portion of the stomach in which bismuth alone was deposited. This behavior of the gastric shadow was noted only with the patient in the recumbent position. It was furthermore noteworthy that the X-ray findings were suggestive of gastrectasis, while the clinical signs of stagnation were absent. These signs are regarded by the author as important indications for the diagnosis of hair ball. Although the diagnosis of hair ball was not made by the writer (Hausmann, 37) nor by others who had seen the patient (the pre-operative diagnosis was tumor of the spleen), the author lays stress upon three new signs, to which he attaches special importance in the diagnosis of gastric trichobezoar:

1. The characteristic behavior of the greater curvature on palpation, i.e., the greater curvature of the stomach becomes palpable when the stomach is contracted in active peristalsis and the bezoar is gripped firmly by the muscular contraction. It is not palpable when the stomach is relaxed and does not grip the foreign body.

2. The presence of fatty acid plates and needles in the contents of the fasting stomach, and the absence of starch and muscle-fibers. (These peculiar findings were not explained until the operation, when the hair ball was found to be infiltrated with fat which had resisted the digestive juices of the stomach and had been caught mechanically in the meshes, while the starchy and albuminous substances were digested and discharged out of the stomach.)

3. The revelations of the fluoroscopic screen or radiograph when a bismuth meal was administered, which distinctly proved the *intra*gastric position of the tumor.

The spontaneous (peristaltic) displacement of the tumor, which was pointed out by Schreiber (38) in 1896 as of diagnostic value, may occur also in other movable tumors, according to the variable contractility of the stomach or intestines. It is of no special diagnostic significance in hair ball, and is, in fact, often absent.

But the special features and proper interpretation of the fluoroscopic image and radiographic picture of hair ball have been

presented with far greater clearness in the later observations of Ramsbottom and Barclay (12) and C. Thurston Holland (5). Ramsbottom and Barclay (12) believe that theirs is the first case that has been absolutely and definitely diagnosed by this means. In this case, a woman, aged twenty-eight years, the X-ray examination showed the existence of a hair ball. The operation which followed proved the accuracy of the pre-operative diagnosis, which was so complete that not only was the nature and shape of the tumor predicted, but also its size, which was given as 9 inches long by 3 inches in width. "The examination was conducted with the patient in the erect position, the bismuth meal flowed at once into the stomach and began to canalize down the greater curvature. Presently, as more food was given, the shadow extended along the lesser curvature, apparently around the mass which was evidently, therefore, not to the inner side of the stomach, but either *inside*, in *front*, or *behind* it. A little manipulation and rotation of the patient quickly demonstrated that the mass displacing the bismuth (showing as a lighter area in the midst of the dark shadow of the bismuth) was actually *within* the stomach. By means of palpation, it was easy to demonstrate that it was freely movable within the stomach. The tumor could be displaced, the top of it rising above the level of the bismuth food, and showing as a rounded shadow in the clear air space in the fundus of the stomach. In order to demonstrate the nature of the tumor still more clearly, the fundus of the stomach was distended with CO_2 and into the larger gastric vesicle thus obtained, the hair ball was pushed up. It gave a heavy shadow because of the coating of bismuth it carried up with it."

C. Thurston Holland (5) reported in 1913 and 1914, two cases of hair ball in the stomach, which, from the radiographic point of view, are of great interest and value. In the first case, in spite of the suggestiveness of the picture, the exact diagnosis of the true nature of the gastric tumor was only mentioned, but not definitely stated. In the second case the exact diagnosis was made and stated definitely before the operation. This second case (1914) may be summarized as follows from Mr. Holland's report:

A girl, aged sixteen years, was referred to Mr. Holland for radiographic study. The history was that she had a very large abdominal tumor for eleven years. This had been diagnosticated at various times by several medical men as a tumor of the spleen, liver, or kidneys. "Operation had been suggested, but as no definite diagnosis had been made, the mother refused to allow one. For five or six years, 'up to a year ago' there had been a constant vomiting of food. This had stopped twelve months ago, but lately had started again. There was no pain, but some tenderness in the upper right abdomen."

Holland (5) writes: "With a vivid recollection of my first case, the diagnosis appeared quite certain and I made a definite diagnosis of hair ball in the stomach before the X-ray examination. The tumor presented itself as a large, hard mass, curving down from below the left costal margin. The right border was quite smooth and curved down with an even edge to two inches below the umbilicus, then turned upward to the right, to disappear under the lower edge of the liver. It was very hard, and there was tenderness just beneath the liver, to the right of the median line. The whole lower part could be grasped between the hands and then the tumor could be swung from side to side of the abdomen, as if suspended from a fixed point behind the upper left costal margin. The history was then discussed more fully with the mother, and the fact elicited that no one had ever suggested to her any other diagnosis except that of 'tumor of the spleen, liver, or kidneys'—these were the mother's own words. I then asked a direct question: 'Are you sure that no one has ever suggested to you that the tumor consisted of hair?' The answer was significant: 'No, but now that you mention hair, I remember that when she was four or five years of age she used not only to bite off her own hair, but also, in her sleep, to pick off and chew bits of blanket.' "

The radiographic appearances in this case, as given by Mr. Holland, are so characteristic that they are worth quoting for the guidance of other observers:

"1. Before any food was given, it was possible to make out the general shape of the tumor on the screen and to differentiate it from the liver, as it was thrown into relief by the gas-distended transverse colon. (The plate which shows the radiographic image in my case (see Fig. 2) coincides perfectly with the observation of Mr. Holland. The air-distended transverse colon completely outlines the contour of the stomach which appears as a dark shadow caused by the dense hair mass.)

"2. The first few mouthfuls of liquid barium meal remained held up in the cardiac end of the stomach and spread out as if forming a cap to something inside of the stomach. (C. T. Holland's second case; Fig. 3.)

Fig. 3. Radiograph of Dr. C. T. Holland's second case of hair ball in the stomach. "The first few mouthfuls of liquid barium meal remained held up in the cardiac end of the stomach and spread out as if forming a cap to something inside of the stomach." (From the *Archives of the Röntgen Ray*, March, 1914, plate 437. By kind permission of the publishers.)

"3. Shortly after swallowing a breakfast cupful of the food, the whole stomach was mapped out by what was obviously the barium lying between the walls of the stomach and the less opaque mass filling it. (Holland's plate, Fig. 4.)

"It was then obvious that an enormous mass — the hair ball — filled the entire stomach right up to the pyloric end, the J-shape being most beautifully shown.

"A few days later, Mr. Newbolt removed a large hair ball, 10 inches in length, which weighed two pounds 12 ounces. The patient made an excellent recovery."

From these general observations we may conclude that the pre-operative diagnosis of hair ball is possible and not difficult if the following facts are borne in mind:

1. That over 90 per cent of hair balls occur in girls or young women.

2. That a careful interrogatory as to habits in childhood or puberty will often give a suggestive clue to the hair-eating habit.

3. That the examination of the stools frequently reveals particles or strands of hair, and that lavage of the stomach will bring up particles or detached strands of hair.

If these preliminary facts can be obtained the pre-operative diagnosis only needs confirmation by the physical and radiographic examination which should show (*a*) a shadow in the region of the stomach (epigastrium) of a characteristic J-shape (Holland, 5) fringed at its lower border by a crescent lining formed by the gas-distended transverse colon. This will (*b*) localize the gastric area and exclude the spleen and omentum, as these lie outside of the colonic loop. The liver can usually be distinguished from the stomach area by a faint darker outline. The further differentiation is accomplished by

4. Administration of a contrast meal of bismuth or barium in suspension, which will, at once, isolate the hair ball, either by surrounding it completely, leaving a paler and fainter area wherever the mixture has failed to penetrate the hair mass, or in large hair balls, by the differentiating fluid finding its way between the stomach wall and the tumor. A distinct gastric contour is thus obtained within which the intragastric mass is defined by the gradual spreading of the contrast material on the outer surface of the hair ball. Or if this consists of two or more segments, as in Holland's (5) first case, by the penetration of the contrast fluid into the interspace which subdivides the mass (see Fig. 5).

5. Finally, while the progress of the bismuth or barium meal is being watched, the displacement of the intragastric mass can be observed as it is moved upward or sideways by manipulation. If the displacement of a foreign body within the stomach can be made out clearly and unmistakably, and the mass is more or less molded on the contour of the stomach, it is almost impossible for the mass in the stomach to be anything else than a hair ball.

The real difficulty in the diagnosis of these cases lies in the usual inadvertence or unpreparedness of the operator for the possible presence of a hair ball — the condition being

Fig. 4. Radiograph of Dr. C. T. Holland's second case of hair ball in the stomach. "Shortly after swallowing a breakfast cupful of the contrast meal the whole stomach was mapped out by what was obviously the barium lying between the walls of the stomach and the less opaque mass filling it." (From the *Archives of the Röntgen Ray*, March, 1914, plate 437. By permission of the publishers.)

Fig. 5. Dr. C. T. Holland's first case of hair ball in the stomach. The radiograph shows a hair cast formed of three parts. The upper and lower masses articulated with the center one by smooth-faceted surfaces. (From the *Archives of the Röntgen Ray*, July, 1913, plate 417. By permission of the publishers.)

so rare that it is scarcely considered or thought of unless the operator has had his attention directed to it by previous experience or personal knowledge of other cases. From this point of view alone the presentation and discussion of these cases is valuable and should be encouraged in medical societies. In the past, when radiographic investigations were not available, it was never possible to make a pre-operative diagnosis except by the suggestiveness of the previous history or the presence of hair in the vomit or in the stools. At present, with a constantly improving fluoroscopic and radiographic technique everywhere available, it would seem almost impossible to miss the diagnosis whenever the resources of the X-ray examination are systematically applied.

AUTHOR'S OBSERVATION

The subject of this observation, Miss B., aged nineteen years, of Geneva, Alabama, was admitted, by recommendation of her family physician, Dr. Chapman, to the Touro Infirmary, on May 5, 1914. She is a pale, emaciated girl, who, though nineteen years of age, has never menstruated. She is intelligent and in every way a sensible young woman, but has been sickly since her earliest childhood. Her parents are dead; both died of cancer; apart from this fact there are no antecedents of special importance, except that she was infested in her childhood, like a great many people in her section of the country, with hookworm. An older sister who accompanies her added very little to her early history, and recalled no special habits of the patient until the operation revealed the true nature of her present trouble. Five years ago the patient began to vomit. She vomited nearly everything she ate. She never complained of severe pain, only of vomiting, weakness, and a progressive loss of flesh, which reduced her to her present marasmic condition. She also suffered frequently from headaches, which

were attributed to her amenorrhœa and marked anæmia. Four years ago she consulted two prominent physicians in Montgomery, Alabama, who recognized her disease as uncinariasis and treated her vigorously for this condition. After their treatment, she improved very decidedly and continued to do well for about six months, when she again relapsed and began to vomit her food as before. Her physician states that at that time she had a large mass in the upper abdomen, which he and others thought was an enlarged spleen. Since January, 1914, she has vomited her food more frequently than ever before and the vomited matter has often been of a dark, blackish color, suggestive of hæmorrhagic vomit.

The physical examination on admission, May 18, 1914, is recorded in the history sheet as follows: A pale, thin, undeveloped girl, about five feet in height, and weighing scarcely 100 pounds. The lips and conjunctivæ show some color, otherwise, she is quite pale. The pulse 70 to 80. Blood pressure: systolic, 118. The blood picture shows the following: hæmoglobin, 60 per cent.; color index, 0.6. Total red count, 3,110,000; total white count, 12,850; lymphocytes, 31 per cent; large mononuclears, 2 per cent; polymorphonuclear neutrophiles, 67 per cent; no plasmodia malariæ.

The fæces showed occult blood with the benzidin and guiac tests, and hookworm ova in appreciable numbers.

The urine was normal. The Wassermann (original) and Tschernogubow were both negative.

The thorax was large and symmetrical, somewhat expanded, and prominent on a level, with lower costal arch. The heart and lungs were normal.

On inspection, attention is at once drawn to the abdomen which shows a projection or eminence, extending diagonally across the upper and middle abdomen, from the left hypochondrium to the upper boundary of the right iliac fossa. This mass moves on changing position to the right or left, as the patient turns to either side. It also moves during respiration, being displaced downward on deep and forced inspiration. Standing has little effect upon its position. On palpation, a large crescentic tumor can be felt lying in the upper abdomen, which has the outline of a dilated stomach. The mass distinctly projects from the left hypochondrium and is hidden in its upper and widest portion, under the left costal border, apparently resting under the left dome of the diaphragm, which can be mapped out by percussion dullness. The resonant space of Traube is here supplanted by a dull, flat area. The dull area extends to the fifth costal cartilage in front, eighth rib in the axillary line, and tenth rib posteriorly in scapular line. From this origin, it can be felt as a well-defined, hard, resisting body, extending into the abdominal cavity to a point, two fingers in breadth, below the umbilical level and about 4 inches to the right of the umbilicus. From the level of the umbilicus, the mass curves up along the semilunaris, which it almost touches. The shape of the mass suggests the idea of an inverted gourd with a long neck the large end or base lying under the diaphragm.

The veins on the surface of the abdomen stand out prominently, especially in the left hypochondrium. The left epigastric anastomosis is particularly well mapped out under the thin abdominal skin. To the touch, the mass feels hard and fibrous; in some places it gives the impression of a ligneous hardness.

From the simple standpoint of topography, the following possibilities were considered:

1. A large tumor involving the stomach itself.
2. A large tumor of the great omentum.
3. A splenomegaly, with displacement of the spleen.
4. A tumor of the left lobe of the liver.
5. A tumor of the pancreas.

At this stage, a radiograph was made by the radiologist of the infirmary, Dr. Samuel (see Fig. 2). This plainly showed a tumor shadow which corresponded with the position of the dilated and prolapsed stomach, which in outline was identical with the big "J" of the normal stomach. This outline was well defined by the loop of the gas-distended transverse colon, which fringes the greater curvature of the stomach from the hepatic to the unusually high splenic flexure.

The radiograph plainly excluded the spleen, liver, and omentum, and definitely localized the tumor in the gastric area. The mobility of the mass excluded the pancreas. Here the diagnosis rested, as a large tumor of the stomach of unknown character. Unfortunately, no bismuth meal was given, and this was a great omission, as the percolation of the opaque fluid between the gastric wall and the tumor itself would have clinched not only the diagnosis of a gastric tumor, but of an *intra*gastric and detachable mass, which could have been moved (by manipulation under the fluoroscopic screen) within the gastric shadow, as outlined by the contrast meal. If this had been done, we would perhaps have thought of a hair ball as the only foreign body which could mold itself to the shape of the stomach and attain such large proportions. We would then probably have gone back to the patient and cross-questioned her for evidence of hair swallowing, an admission which was obtained easily enough when the patient and her sister were confronted after the operation with the corpus delicti. As it was, the attending physician, who lives far away, was anxious to be present at the operation and as he was pressed with the necessity of his early return home, we decided not to delay the operation on account of further fluoroscopic examinations. The indication for relief was urgent, and justified an exploration of the tumor, which was clearly connected with the stomach, but was still of an unknown nature or

causation. If we had only followed our routine custom, to make systematic X-ray examination with the aid of contrast meal in all cases of gastric disease, we would probably have had the satisfaction of completing the diagnosis *ante* and not *post operationem*, and thus have anticipated the revelations of the operation on May 22, 1914.

The operation was performed under ether anæsthesia (Dr. Landry; assistants, Drs. Gessner, Craddock, and Turner).

Median incision about six and a half inches in the epigastric region, extending about one and a half inches to left of umbilicus. The stomach at once presented, very much dilated, with transverse colon attached to its lower border. It became evident immediately that the tumor was intragastric and not attached to the stomach walls. An incision, six inches in length, was made along the anterior surface, in the space midway between the lesser and the greater curvatures, with its center about the middle of the anterior surface of the stomach. The stomach walls, on examination were found to be hypertrophied. The bleeding from the walls of the stomach was controlled by prophylactic clamping. A huge hair ball, slimy, and coated with foul gastric secretion, and of exceedingly hard consistency, was now revealed. The mass was shaped like the stomach, following the contour of the fundus and the greater and lesser curvature and pylorus. It was extracted entire, without great difficulty and, when removed, had the appearance of a large gourd. After wiping off the cavity of the stomach, which contained chyme and considerable thick, tenacious mucus, the gastrotomy incision was closed by four planes of sutures. The first two rows of sutures were hemostatic and included only the mucosa. The seromuscular coat was sutured separately and a final inverting stitch, continuing at right angles, was made with linen, which had been used for all the other sutures.

After finishing the toilet of the peritoneum, the abdominal wound was closed by sutures: the peritoneum with iodized catgut (Bartlett); the muscular planes with the same material, and the skin with through and through silk-worm sutures and plain iodized catgut.

The specimen (Fig. 1) weighed two pounds three-fourth ounces, or approximately 967 grams. It was shaped like an inverted gourd and was molded to the contour of the stomach. In the dry state, it measured 18 inches or 46 cm. in its longest diameter (along its convexity), 10¼ inches or 26 cm. in its broadest circumference; 8¼ inches or 20 cm. around its middle portion, and 6⅞ inches or 17 cm. in its narrowest circumference. The widest part filled the fundus of the stomach, and its narrowest filled the pylorus and duodenum.

It consisted of a mass of matted black hair which, when dry, was felted and gave the appearance of the fur of a wild animal. Mixed with the hair, were particles of earth and vegetable foodstuffs which had gravitated to the center of the mass and were held in the tangle by mucoid and other organic matter. The mass not only filled the stomach in its entirety, but was gripped tightly by its walls in many places.

An incision of 6½ inches along the anterior surface of the organ was required to permit its extraction. When extracted from the stomach, it was covered with a thick, slimy coat of extreme foulness. The only space for the passage of food was a narrow interspace between the mass and the lesser curvature, where fluids and semisolid foods could be forced from the cardia to the pylorus.

When the patient's sister was told of the nature of the mass, she recalled that the patient had, in earlier childhood, when about six years of age, begun to chew her hair. At first no one suspected this habit, but the fact that her hair never grew long and was apparently always kept cropped, led to an investigation, when it was discovered that she chewed and swallowed her own hair. How long she continued in this practice is not known with exactness, but the girl admits that up to comparatively recent years she indulged in the habit unconsciously and as a mere habit which had grown upon her, without any explanation in her own mind except that she found a childish pleasure in chewing her hair, as well as crumbs of earth and clay, as is often the case with the victims of hookworm disease.

The subsequent history of the patient is uneventful. Apart from a stitch abscess, the wound healed well, and her general condition improved with extraordinary rapidity as convalescence was established and a normal gastric digestion returned. She was discharged from the infirmary on June 19, quite strong and gaining rapidly in flesh. Since her return home she has gained steadily in weight and is now enjoying better health than at any previous time in her life.

SUPPLEMENTARY COMMENTARIES ON BEZOARS

A great deal of curious information pertaining more to the domain of medical archæology and history, rather than to practical surgery, is associated with the history of bezoars. While not pertinent to a strictly practical paper on the subject of hair balls (which are only a variety of bezoars) the author believes that a supplementary note, written largely from the antiquarian's point of view, may prove of interest to the general reader. Many references of bibliographic and archæologic interest in connection with bezoars may be found in the Catalogue of the Surgeon-General's Library and the *Index Medicus*. An excellent historical summary will be found in the *Dictionnaire Dechambre*, by Dechambre. The latest contribution to this curious subject is pre-

sented by Dr. A. Burchard, under the title "Bezoars in die alte und in die moderne Medizin,' [1] which not only discusses the history of bezoars, but also considers them most interestingly from the point of view of their X-ray relations. I have quoted freely from this valuable and most recent paper in abstract, eliminating the X-ray discussion as applied to human hair balls, as this phase of the subject is fully discussed in the text of this paper.

Bezoars represented an important remedy in the pharmacopœia of Antiquity and of the Middle Ages, even up to the eighteenth century.

Among ancient Hindoos, bezoar stones from goats' stomachs were a well-known remedy, which is mentioned in the writings of Susruta in the twelfth century before Christ. It is met with again among the Persians in the manuscript of Muwaffak (968-77) (*Liber fundamentorum pharmacologiæ*) where the bezoar of goats is also enumerated among 44 drugs derived from the animal kingdom. The Arabs were likewise acquainted with this remedy and "bezoar" is probably derived from the Arabian word Badzehr, so that it is of Arabian origin.

Very curious stories were told of the origin of bezoars. In a book by Adam Lowicer, 1582, they are described as solidified or hardened tears of stags. The stags eat poisonous snakes to protect themselves against intestinal worms and then stand for several days up to their neck in water, so that the snake venom may not harm them. Rosin-like tears flow from their eyes, which harden and are rubbed off by the animals on the trees. For accuracy of this statement, Lowicer refers to the Arabian physician, Albenzoar.

The same story is told by George Nikolaus Schurtz, 1673, in his "Material Kammer" where another explanation is added: "In Peru, the Vicuna sheep eat bezoar herbs in order to protect themselves against poisonous pastures and water. This excellent herb causes the bezoar stone to grow in their stomachs and it therefore has the power to destroy poison."

[1] Fortschritte auf dem Gebiete der Roentgenstrahlen, xxii, No. 3, p. 321.

A catalogue "omnium medicamentorum" published in Braunschweig, Germany, in 1706, still contains "Lacrymæ cervi" which certainly means bezoar; and a price list of H. D. Brückner, in Leipzig, also in the eighteenth century, begins with "aegaropylæ," goat balls, or bezoars, which had been forgotten in the interval.

Much confidence was placed in the effect of bezoar stones, which were considered the best remedy against poison, and as extremely efficient against pestilence. Medical agents, which were credited with similar effects, were therefore frequently named after bezoars, so that there was a tinctura bezoardicus, a pulvis bezoardicus, etc., preparations which really contained no bezoar at all.

"Greswell, in his work on 'Diseases of the Ox,' states that at one time they were supposed to possess the power of enchantment against the viper and the scorpion, against vertigo, epilepsy, dysentery, inflammation of the lungs, malignant fever, the plague, leprosy, and many other maladies. According to this writer, it was put down to the astonishing power of the bezoar that King Edward IV of England, was strengthened and preserved from the effects of an empoisoned wound, and the same magical influence was supposed to be the reason why the Emperor Charles V of Spain, was enabled to free himself from the dreadful thoughts which haunted and disturbed his mind." (N. Jacobson.)

No wonder, then, that the superstitious and credulous mediæval mind treated these animal concretions with all the reverence and awe of precious amulets and that some of these bezoars were encased in golden caskets encrusted with precious stones.

"Oswald Croll (1609) mentions bezoar as a constituent of pills which were named Laudanum Paracelsi. In view of this high esteem of bezoar, it is not surprising that it commanded a high price. Oriental bezoar was considered more precious than gold. As a natural sequence, adulterations and imitations made their appearance; balls made of all sorts of substances were passed as bezoars. Lowicer (1582) warns against these and mentions three tests to protect against frauds: (1) Pierce the stone with a red hot needle.

If it is genuine, there will be no smoke. (2) Administer poison to an animal or man, and give a powder made from the stone as a remedy. If the individual survives, the stone is genuine. (3) Triturate the stone with saliva, or with water. If it is genuine, it will discolor a cloth."

In more enlightened days, bezoars as well as bezoardic remedies were abandoned as curative agents and are now met with only as historical curiosities. A large series of these rare stones is preserved in the collection of the Pharmacological Institute of the University of Rostock. Following a suggestion of Kobert, Burchard submitted these stones to X-ray examination, in order to obtain information concerning their structure and composition. These investigations yielded some remarkable findings. Ancient medicine was concerned especially with two kinds of bezoar stones, the Oriental and the Occidental. The Oriental bezoar which occurs principally in the fourth stomach and the intestines of the bezoar goat (capra aegagrus) living in Syria and Persia, and of the gazelle (antelope Dorcas) consists chiefly of cholesterin, bile pigments, and bile salts. It is entirely combustible, diffusing an aromatic odor. The Oriental bezoars examined by Burchard, were, in part, rounded, and in part oval in shape; the exterior was mostly smooth, almost glistening; the diameter between 1 and 5 cm. The radiograph did not invariably show an entirely uniform mass. Most of these bezoars present an internal nucleus which varies with the size of the stone. One bezoar was so compact that the mass did not permit the X-rays to penetrate it, although it was smaller than others, the structure of which was plainly recognizable. Not the slightest suggestion of a structure could be obtained in two spherical preparations of the size of a walnut and of hen's egg, respectively, which were gilded on the outside and were described in the catalogue as Bezoar de Goa, an especially esteemed variety. Perhaps these are not concrements at all, but artificial products, so that the X-ray may permit the distinction of true concrements from artefacts, under certain conditions.

Occidental bezoars come from South America, namely, from the Vicuna sheep (Auchenia Vicuna) and differ from the Oriental by their content in calcium and magnesium phosphate, without cholesterin, bile pigments, and bile salts, so that an incombustible residue is left on incineration. Several specimens were examined by Burchard. Three rough grayish white concretions are designated in the catalogue as Bezoar Porci, presumably from the stomach of the pig.[1] The radiographs show a variable appearance.

The term "bezoar" aside from the above described concretions which were formerly employed for curative purposes, is also applied to another kind of concrement. The hair bezoar or trichobezoar, is frequently found in the gastro-intestinal canal of the domestic animals, notably the horse, cow, angora cat, etc., and, less frequently, in the human stomach. Radiographs of trichobezoar (hair balls) show the closely packed masses of hair. The diagnosis of the presence of similar concretions in the stomach or intestines, in the living subject, has always proved very difficult.

Recently the X-rays have come to the front as an important diagnostic adjunct as we have seen in the text of this paper. As regards the utilization of the X-ray method for the discovery of concretions in the gastro-intestinal canal of animals, where they frequently exist, not much has apparently been accomplished so far, and Marck says in his textbook on the clinical diagnosis of the internal diseases of the domestic animals in 1912, that a successful X-ray examination of the abdominal organs is probably possible only in small animals, because the abundant gastro-intestinal contents of large animals practically prevent the penetration of the X-rays. Also, in small animals, X-ray examinations have so far been limited to the demonstration of foreign bodies in the abdomen and intestines.

Dr. N. S. Mayo, of Chicago, President of the American Veterinary Association, a distinguished authority on this subject, confirms the general impression gathered from veterinary texts that "though hair balls are quite common in cattle, they seldom cause inconvenience and are rarely recognized

[1] Valentini, W. B. De lapide porcino, vulgo pedra del porco [in his: Polychresta exotica, etc.], 4°, Francof. ad Moenum, 1700, 30–44.

except on autopsy, or when the animals are slaughtered. In most cases in cattle these hair balls are found in the rumen, or first division of the stomach, although they may be found in the third and fourth divisions. In a majority of cases, these hair balls become crusted with salts, so that they are hard and frequently present a polished surface. Some, however, are furry on the outside. The majority of these hair balls vary from the size of an egg to a man's fist." Dr. Mayo adds, "So far as I can recall, I do not remember that a hair ball has been definitely diagnosed in cattle before the death of the animal. Cattle frequently swallow hard objects such as bone, pieces of metal, old shoes, rags, etc., that give rise to digestive disturbances, but it would be difficult to differentiate between a hard body of this character and a hair ball."

Dr. Hugh A. Trout, of Roanoke, Virginia, suggested in a personal conversation with the writer that hair balls might possibly be dissolved *intra vitam* if they could be recognized early enough by X-rays, by the use of a hair solvent, such as is used in depilatory pastes in which barium sulphide and starch are the chief ingredients. Dr. Mayo, above quoted, whom he consulted on this point, stated that he was very skeptical as to the efficiency of such a solvent. "In order to obtain a fairly efficient action of barium sulphide, it is necessary that it come in rather close contact with the hair and be held there for a few minutes. The condition of hair balls, as commonly observed in cattle, is such that it would be practically impossible to obtain any continued action from barium sulphide, as the rumen of cattle where these balls mostly occur, is very capacious." (Quoted from a letter addressed to Dr. Trout on December 23, 1914, by Dr. Mayo, and kindly transmitted by the former to Dr. Matas.)

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CYSTS OF THE PROSTATE[1]

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THE case here detailed resembling the usual condition attending urinary obstruction dependent upon an enlarged benign prostate is of unusual interest because of the operative and post-mortem findings, which show the urinary obstruction to be dependent upon a large cyst of the vesicula prostatica, or sinus pocularis, associated with carcinoma of the prostate.

Male, 58 years old, referred by Dr. A. E. Beaton January 8, 1913. The past history revealed the fact that he had gonorrhœa in early manhood, followed by stricture. The stricture was treated for one year and no instrument had then been passed for at least twenty years. During the past year there had been a gradual increase in the frequency of urination and at the present time urination occurred about every hour and a half during the day and night. The stream started with difficulty, was small, and had no projection. There was a slight discomfort over the pubis when the bladder was distended. He had never passed blood, and the urine was noticed to be slightly cloudy. Dr. Beaton was unable to pass a catheter into the bladder.

Physical examination showed the patient to be obese, moderately sclerotic, blood pressure 148, and the heart normal, except for an accentuation of the second aortic sound. Rectal examination revealed a very large prostate, bulging to an unusual degree into the rectum. The surface was smooth and much rounded, equal on both sides, not tender, and with the consistency of a large benign prostate. Massage failed to bring any material from the meatus. The bladder was entered by a coudé catheter No. 18 Fr. The residual urine was 20 ounces. The urine examination showed it to be clear, 1,010, no albumin or sugar and no abnormal elements in the microscopical examination. The cystoscopic examination showed the bladder capacity to be 25 ounces. There was considerable resistance to the passage of the cystoscope through the prostatic urethra. The bladder was moderately trabeculated; the ureteral orifices normal; and there was a small amount of posterior intravesical and lateral lobe projection. Palpation with the cystoscope in the urethra and the finger in the rectum revealed the tissue posterior to the urethra to be greatly increased. The phthalein test showed 48 per cent eliminated in one hour.

A catheter was retained in the bladder for three days and the bladder frequently irrigated. At the end of this time the patient had a chill and the temperature rose to 103°. Dr. Horace Binney saw the patient in my absence and found the prostate as previously noted except that he thought that it was slightly fluctuant and believed that the patient might have a prostatic abscess. The urine at this time was slightly cloudy. The catheter was removed for two days at which time the temperature had subsided. The catheter was then replaced, the residual urine was 18 ounces and slightly cloudy; the microscopic examination showed much pus. The bladder was frequently irrigated through the retained catheter. The temperature continued to range below 100° and the patient's general condition was fairly good.

Operation January 20, 1913. A median perineal incision was made upon a grooved staff. The finger, introduced into the wound, revealed the fact that the prostatic urethra was very tight. As the finger was forced into the prostatic urethra it broke into a cavity, and it was believed that it might have entered the rectum. Upon withdrawing the finger there was an escape of from four to six ounces of a thin fluid. Examination, by rectum, showed that the rectum had not been entered. With the finger still in the rectum and another in the cyst sac the cyst surface was found to be slightly elevated, soft, and velvety. The prostatic tissue above the sac was small in amount and very hard. Part of it was removed with scissors, there being no line of cleavage. The finger placed through the vesical sphincter showed no intravesical projections. A perineal tube was placed in the bladder, and another tube in the cyst.

The patient died four days following operation. Post-mortem examination produced the illustrated specimen. The abdomen was negative except for carcinomatous nodes in the mesentery and pelvis. A microscopic examination of the prostatic tissues and the nodes proved them to be carcinoma.

In reviewing the pathological literature on the subject of cysts of the prostate, it is found that the subject is divided into three classes: (1) cysts dependent upon obstruction of the prostatic ducts with retention of secretion; (2) cystic dilatation of the remnant of Müllers duct which is the homologue of the vesicula prostatica or sinus pocularis; (3) echinococcus cysts. Each condition is very rare, from the post-mortem standpoint as well as clinically.

There is little clinical literature referring to any of the forms of prostatic cysts. That which I have been able to find consists mostly of isolated case reports in which the condition

[1] Read at the meeting of the American Association of Genito-Urinary Surgeons ,White Sulphur Springs, May 18–20, 1915.

was not recognized prior to operation or death. The reported cases are best considered under the pathological classification already mentioned, there being only two cases which cannot be so classified. These cases are dermoids involving the prostate if not primary in it; one described by Quervain and another questionable case reported by Pretty. Quervain's case was a man 58 years old, who for 18 years had suffered from dysuria resulting in complete obstruction. The condition was supposed to be dependent upon prostatic obstruction. Operation revealed a dermoid cyst completely filling the pelvis and extending upward to within one finger's breadth of the umbilicus. By a series of operations the tumor was removed and the patient recovered.

1. *Cysts dependent upon obstruction of the prostatic ducts with dilatation of the acini from retained secretions.* This class is the most common, and is believed by Englisch to be congenital in origin. In autopsis on seventy newborn male children he found five instances of cyst formation near the sinus pocularis.

The fact that the majority of the recorded cases were under fifty years of age and the histological study of some of the post-mortem material, especially the study of Englisch, forms the basis for the belief that the origin of these cysts is congenital. Yet the histological studies of Desnos are at variance with those of Englisch which has led to the belief by Legueu and Verliac that the embryological inclusions may be of a different order. The cysts seldom attain much size. They are usually single, small, and unilocular, yet they have less often been observed to be multiple and multilocular. Le Denteu believes that the cysts are formed by the coalescence of several dilated acini; the partitions being wholly or partially destroyed by pressure atrophy. They have been most commonly observed projecting into the prostatic urethra and covered by the urethral mucous membrane, and less commonly projecting into the bladder near the bladder sphincter. The cyst content is a viscid, clear, opaque, or yellowish-brown albuminous fluid containing epithelial cells, leucocytes and detritus; but no organisms have been demonstrated in the cyst content of any of the recorded cases. The histological study of the cyst walls have shown them to be lined with squamous epithelium in most instances but in a few, cylindrical epithelium has been found.

Following is a summary of the recorded cases of this type.

Englisch. Man 40 years old. Cyst discovered post-mortem; single, and protruding into the bladder like a middle lobe of the prostate, beneath the mucous membrane of the bladder. In size, 1.3 by 1.5 cm. The thickness of the cyst wall was 1 mm. The content was an albuminous fluid with epithelial cells and detritus. The histology showed the cyst walls to be composed of round and cylindrical cell epithelium.

Dolbeau. Post-mortem specimen. Cyst found on either side of the verum montanum. Cysts the size of peas projecting into the prostatic urethra and covered by the urethral mucous membrane.

Le Denteu. Post-mortem specimen obtained from a man who had hæmaturia. The bladder was trabeculated and contained several stones. Posterior to the urethra was a cyst the size of an apple extending from the lower part of the prostatic urethra to the vesical sphincter. The ducts of the prostate were much dilated. The cyst was unilocular and was believed to be due to the coalescence of many dilated acini.

Home. Man, 60 years of age in whom no catheter could be introduced into the bladder. The post-mortem specimen showed a cyst of the prostate the size of an apple with numerous dilated prostatic ducts the size of goose quills.

Desnos. Post-mortem specimen obtained from a man 70 years old which showed a dilated bladder and a prostate the size of an apple. There was a cyst the size of an egg, posterior to the urethra, but not connected with the sinus pocularis or ejaculatory ducts. Pressure on the prostate brought forth a somewhat sticky reddish brown fluid from the prostatic ducts and the glandular elements of the prostate were everywhere dilated. The histology of the cyst wall showed it to be made up of connective tissue with large numbers of spindle cells and the inner surface lined with a cubical epithelium. Desnos believes that the cyst was due to a coalescence of numerous small retention cysts.

Socin. Post-mortem specimen obtained from a man 59 years old. A cyst the size of a bean and covered by urethral mucous membrane was situated at the posterior right side of the prostatic urethra. The content was clear and serous in character.

Burkhart. Man 51 years old who for six months had dysuria with partial retention. Cystoscopy showed a cyst the size of a walnut, round in shape, and close to the orifice of the bladder. It was red-

dish gray and translucent. The cyst was destroyed by a suprapubic operation.

Kornfeld. Man 30 years old with acute retention. Rectal examination revealed a large tumor of the prostate, not tender. On pressure the left lobe disappeared with the appearance of blood tinged fluid from the meatus. The symptoms disappeared.

Butruille. Man 69 years old with symptoms of retention of urine, and a very large prostate by rectum which was fluctuant, and believed to be a prostatic abscess. The patient developed pneumonia and died. Post-mortem specimen showed a large tumor of the prostate consisting of a multilocular cyst involving all lobes of the prostate.

Legueu and Verliac. Man 40 years old with retention of urine. The condition was believed to be prostatic obstruction because of the retention and resistance to the passage of instruments through the prostatic urethra. Operation did not reveal an obstructive gland. After death the post-mortem specimen showed a cyst in the right lobe of the prostate and a smaller one directly behind it. The larger cyst was the size of a grape and the smaller the size of a pea. The remainder of the prostate was normal. The histology of the cyst showed it to be lined with pavement epithelium.

Falta. A case of multiple retention cysts which were the size of poppy seeds found at autopsy in a man 77 years old who died of "cancerous cachexia."

Burger and Oppenheimer. Man, 38, died of peritonitis. A cyst, the size of a large pea, was located in the left lobe of the prostate, just below the internal sphincter and projecting into the urethra. Surrounding it were a few tiny pin-head sized cysts. The cysts were directly beneath the urethral mucous membrane. The content was a thick, mucoid, greenish yellow fluid which contained a few degenerated epithelial cells and granular detritus.

Abbe. Man, 35 years old, with retention of urine for one year. Examination showed no enlargement of the prostate and a residual urine of one pint. A suprapubic cystotomy revealed a cyst the size of a cherry located at the anterior margin of the internal meatus and projecting into the bladder. The cyst was removed, the patient recovered, and the symptoms were relieved.

Arthur Cabot records two cases. One a man 87 years of age who was leading a catheter life for complete obstruction, prostatic in origin. The prostate was much enlarged, fluctuant, and resembled a prostatic abscess. The tumor was punctured by a trocar through the rectum and two ounces of a viscid fluid was obtained. The patient died 17 days later of pyelonephritis. The post-mortem specimen showed early carcinoma of the prostate, and besides the emptied cyst cavity there was another smaller cyst, containing a thick, opaque, yellowish-white fluid with epithelium, leucocytes and debris, but no organisms.

The second case was a man 46 years old with symptoms of retention. Cystoscopy revealed a cyst the size of a cherry located to the left of the bladder outlet and projecting into the bladder. The cyst was destroyed by a suprapubic operation.

Mikhailow, in recording a case of a cyst of the sinus pocularis mentions six cases of cysts of the prostatic ducts which he had observed but I have been unable to find any record of them.

2. *The second class, that of dilatation of the vesicula prostatica*, is generally considered to be congenital in origin and dependent upon a defect in the process of obliteration of Müller's duct.

The utricle, being a remnant of Müller's duct, has no genetic relation to the prostate gland or the seminal vesicles. Congenital defects in the obliteration of this structure, may result in cysts, which in themselves obstruct the outflow of urine or by the disturbances of adjacent structures may interfere with micturition or the ejaculation of semen.

Springer found two cysts of the sinus pocularis in autopsies performed on sixty-two male children who died soon after birth. Cysts of this type are unilocular and may obtain a considerable size, the one already described and illustrated here being the size of a large lemon.

When the cysts are small they are found in the prostatic urethra, as observed by Mikhailow; when large, the swelling not only obstructs the urethra but projects backward into the rectum as a rounded tumor resembling bilateral lobe enlargement of the gland.

The lesser distended sinus pocularis which is occasionally observed by rectal palpation in those cases presenting a condition similar to chronic prostatitis, and from which the retained secretion may be expressed by rectal pressure leaving a depression at this point, may, in the writer's opinion be considered as acquired rather than congenital and dependent upon inflammatory changes, because of the microscopical character of the expressed secretion. The cystic condition of the gland, of the variety just mentioned, is now, not infrequently observed by the use of the posterior urethroscope and may or may not be a stage in the development of the larger sinus pocularis cysts. Yet the information obtained by the examination of the cyst content, which is possible by massage, should determine the point.

The recorded cases of cyst of the vesicula prostatica are very few; four by Springer; one by Mikhailow, and one by the writer being the only examples of this variety of prostatic cyst. Mikhailow's case was the only one diagnosed ante-mortem.

The symptoms have been those of retention, with obstruction in the prostate.

Following is a brief summary of the recorded cases:

Springer records four cases and states that he found two instances of cyst of the utricle in autopsies on sixty-two male children who died soon after birth.

CASE 1. Male 23 years old. Autopsy specimen, showing an oval cyst the size of a bean protruding from the posterior surface of the prostatic urethra and originating in the utricle.

CASE 2. Male, 47 years old, autopsy specimen showing slight hypertrophy of the prostate and the utricle twice normal size, cystic in character, and protruding into the prostatic urethra. The ejaculatory ducts were normal.

CASE 3. Child, 1 year 9 months old. Autopsy specimen shows a cyst the size of a pea occupying the site of the utricle, which contained a yellowish, opaque fluid with amylaceous bodies.

CASE 4. Male. 41 years old. Autopsy specimen showed the prostate to be normal; and projecting into the prostatic urethra was a cyst of the utricle 3 x 5 mm. The content was a whitish opaque fluid and the cyst wall was composed of a layer of connective tissue lined with squamous epithelium.

Mikhailow reports a case of a small cyst of the sinus pocularis in a man 28 years old who gave symptoms of sexual disturbances. Through a deep endoscope a cyst 1 x 1.8 cm. at the site of the utricle was discovered projecting into the prostatic urethra. The cyst was destroyed through the endoscope. The content was a yellowish grey fluid which contained albumin.

3. *The third class, that of echinococcus cysts involving the prostate* have been occasionally observed by the pathologist, and have been recorded clinically by Bangs; Tillaux; Millet; Durrieux; Mallez; Tuffier; Lavigne, two cases; Routier; Bryant; Dolbeau; Duplay; Spence; Maunder; Nicaise; Wood; Kaveczky; Uruterberg; and Loudell. Cysts of this type have the character of the echinococcus cysts occurring anywhere in the body. There is some debate as to whether these cysts ever occur primarily in the prostate, or, originating in the pouch of Douglas later become a contingent part of the gland, resulting in the appearance of their being primary in the gland and giving rise to the symptoms which have drawn attention to the prostatic feature of the condition. The recorded cases in most instances have shown cysts elsewhere in the abdomen, and Sir Henry Thompson believes that hydatid cysts, primary in the prostate, have never been observed; but when they involve the prostate are secondary to such cysts located between the bladder and the rectum. Le Dentu, Marclie, Lannelogue, Perrier, and most other observers are of the same opinion. Bangs, Tillaux, and Millet who have each observed a case clinically, hold of the opposite view; and Nicaise, who studied twenty-three recorded cases of hydatids of the pelvis found seven which had a close relation to the prostate although it was only suggestive that they were primary at this site.

Like the preceding two classes of prostatic cysts, the gland has been found enlarged by rectal touch and the symptoms were those of obstruction with retention of urine; yet the presence of associated abdominal tumors has served as a diagnostic feature of this class.

The *diagnosis* of prostatic cysts of whatever variety must necessarily remain difficult, unless the cysts are revealed by urethroscopy or cystoscopy. In the first class, *that of retention cysts*, this must be the only means of diagnosis because when cysts remain small they are within the prostatic urethra and when larger present in the bladder as in the cases recorded by Cabot, Abbe, and Burkhart.

In the second class, *cysts of the sinus pocularis*, a suggestion of the true condition may be had if the rectal tumor is fluctuant, yet, the intracystic pressure must necessarily be considerable and a fluctuant tumor has not been present in any of the recorded cases of this class. What value the newer methods of examining the deep urethra may offer is chiefly speculative. The most valuable sign to offer a cue to the true condition in the opinion of the writer, is the increased distance between the urethra and the rectum in instances where the usual character of a carcinomatous prostate is absent. The detection of an increased amount of tissue posterior to the urethra by an examination

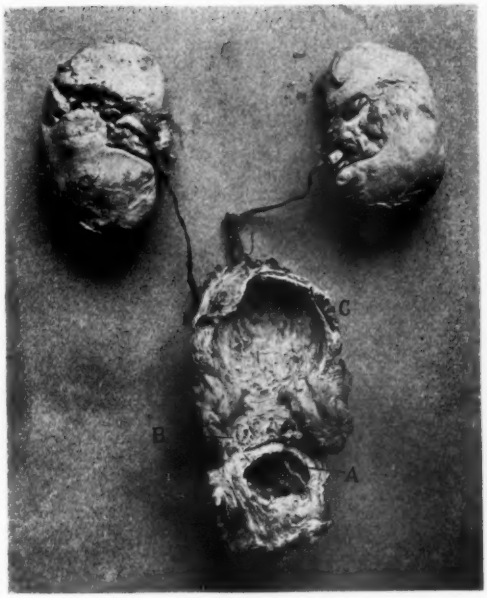

Fig. 1. Anterior view of specimen. *A*, Cyst; *B*, carcinomatous prostatic tissue; *C*, bladder.

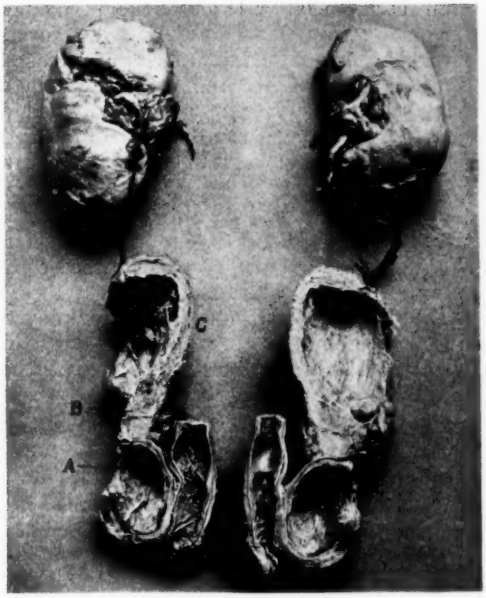

Fig. 2. Lateral view of specimens. *A*, Cyst; *B*, carcinomatous prostatic tissue; *C*, bladder; *D*, rectum.

conducted with an instrument in the urethra and a finger in the rectum in cases with prostatic obstruction and retention, evidently non-cancerous; and yet, obstructive to the passage of instruments through the prostate, would seem to be the only diagnostic feature to suggest a cyst of the prostate of this variety. This same diagnostic observation applies to echinococcus cyst, yet these cysts are more likely to be seen projecting into the bladder with the cystoscope and fluctuation is more likely to be detected in the enlarged gland. Moreover, in echinococcus cysts the abdominal tumor is often large, and associated abdominal swellings in connection with the urinary signs and findings should render a diagnosis in this class more often than in the preceding classes.

In regard to *treatment* no definite operative procedures exist. In the class of retention cysts, Cabot, Abbe, and Burkhart, after observing the cyst projecting into the bladder, destroyed the cyst by a suprapubic operation, but retention cysts confined to the prostatic urethra have not been recognized clinically. If they can be demonstrated by means of the deep urethroscope, their destruction should be easily accomplished with the new instruments devised for operative interference in this region.

Mikhailow, who discovered a small cyst of the sinus pocularis, destroyed it through a deep endoscope with entire relief of symptoms. When small cysts of this variety are discovered this procedure should be easy of accomplishment; but when the cyst is of the size of the one recorded by the writer such a procedure could hardly be expected to accomplish a cure; and an attempt to remove the sac, with or without the prostate, should be undertaken either by the perineal or suprapubic route; but preferably by a dissecting perineal operation.

When an echinococcus cyst is present it is best dealt with by extirpation or incision and drainage; either through the abdomen, perineum, or rectum. The former method has been followed by satisfactory results by Tuffier and by Winterberg, the former accomplishing the extirpation by the abdominal

route and the latter through the perineum. Lavigne incised and drained such cysts through an abdominal approach in two cases. Routier practiced the same procedure in a single case. Bryant incised and drained a case by the perineal route; and incision and drainage was also carried out by Dolbeau and by Duplay in one case each. Spence and Maunder each drained a cyst by rectal puncture, and Tillaux by a rectal incision. Nicaise punctured the cysts in one case by means of a catheter passed into the urethra.

The method of treatment to be employed must necessarily depend upon the type of cyst present and the special features of the cyst in the given case.

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THE SURGICAL TREATMENT OF THE TUBERCULAR URETER IN THE FEMALE[1]

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WHEN performing nephrectomy for tuberculosis of the kidney, consideration of the disposition of the tuberculous ureter is of almost equal importance with that of the kidney itself. Should the ureter be left, removed in part, or in its entirety? When left, how shall it be treated? When removed, by what route or combination of routes can this be best accomplished?

It is the object of this paper to advocate: (1) the removal of the ureter with the kidney whenever tuberculous changes in the ureter exist; (2) the adoption of the combined transperitoneal and retroperitoneal routes when the ureter and the kidney are removed at the same time; (3) the use of this same combination of routes when as a secondary procedure the ureter with its accompanying sinus is removed.

The term "complete" as generally applied to ureterectomy refers to the removal of the lumbar and pelvic portions of the ureter alone. When so used it is confusing, for the vesicovaginal portion is not considered, yet it constitutes an essential part of the tract and its condition may necessitate primary or secondary removal. When the term ureterectomy is used, it will be in reference to the complete removal of the lumbar and pelvic portions, though recognizing that this usage is strictly speaking incorrect, as only part and not the entire tract is referred to.

It is to the student of end-results that we must look for the solution of the problem of primary versus secondary ureterectomy for tuberculosis of the ureter. The removal of the tubercular kidney alone or with part of its ureter may and, in a certain percentage of cases, does, relieve some if not all of the symptoms characteristic of the lesion, yet the best authorities recognize that this relief is by no means certain and that the possibility of distressing and dangerous sequelæ exists. Rövsing states: "Formerly when I removed as much of the ureter as possible and lowered the stump, the latter often became the starting point for an exceedingly dangerous diffused tuberculosis in the retroperitoneal tissue and in the abdomen." Kapshammer is of the opinion that "very little attention has been paid to the disposition of the tubercular ureter in nephrectomy, as a rule the ureter is cut away from the pelvis of the kidney and tied off, many times resulting in post-operative complications." Bovée says: "In fact, in a respectable number of successful nephrectomies for tuberculosis of the kidney, subsequent ureterectomy for tuberculosis of the kidney has had to be done." Henry Morris is of the opinion that "nephrectomy alone is very frequently insufficient to effect a complete cure, etc., etc." Tilden Brown, Kelly, Meyer, and many others could be quoted to support the view that though the activity of the lesion in the ureteral tract may be checked or even destroyed by the removal of the kidney alone, or with a part of its ureter, yet whenever there remains any portion which is the habitat of tubercular bacilli there is of necessity danger lurking, and that the advisability of primary removal of this tissue should receive serious consideration.

In studying the question of primary ureterectomy it is of interest to consider (1) the usual manner of invasion, and (2) the degrees of involvement of the ureter with renal tuberculosis. For some time there existed a diversity of opinion as to the manner or process of ureteral invasion whether by ascent or descent of the urine stream. Today the weight of opinion is in favor of descent or in the direction of flow, that in the downward course of the urine the tubercular bacilli implant themselves on the mucous membrane of the ureter and invade the structure.

Exact information as to the extent of ureteral invasion can be obtained only in those

[1] Read before the American Gynecological Association, White Sulphur Springs, West Virginia, May 18-20, 1915.

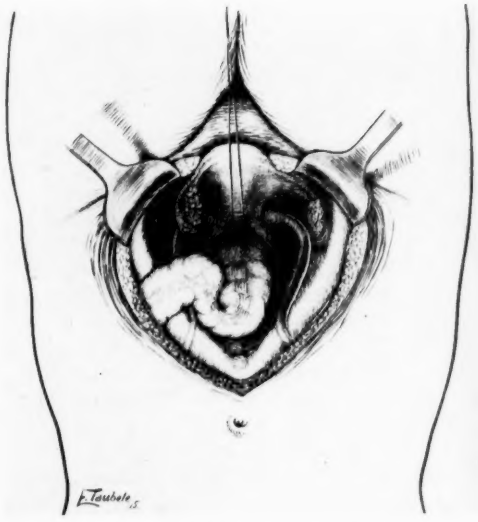

Fig. 1. To secure a field for exact surgical manipulation, a temporary suture is passed through the post-uterine wall near the juncture of the corpus with the cervix. Where traction is made upon this the entire cervical region is brought within easy reach of the operator and the corpus is forced out of the field of vision. A second suture is passed through the ovary of the side affected, then through the outer portion of the round ligament; where this suture is tied the adnexæ are also removed from the field of vision. The incision of the pelvic peritoneum is to the outer side of the ureter and through it the ureter with its fascial sheath is dislodged.

Fig. 2, Case 1. Showing the greatly thickened cellular sheath of the ureter *in situ*.

cases where complete observations have been made either by operation or by autopsy. Steinthal, in 1885, recorded that "in genito-urinary tuberculosis he found the kidney involved in every case, in nine cases the kidney alone and the lower tract in 50 per cent." Fischer, in 1892, records that "in 62 cases of tuberculous disease of the kidney, both kidneys, the ureter and the bladder were affected in 17 and one kidney together with the ureter and bladder were affected in 28." In every instance the ureter was affected but no statement was made as to the extent of involvement. Kelly, in 1914, found that of the 31 specimens in which he has the ureters as well as the kidneys all show tuberculosis of the lower end, and of these, 15 had tubercles distributed through the course of the ureter, while in 8 there were only a few scattered tubercles.

It is not always possible to determine the extent of ureteral involvement prior to operation. Subjective symptoms are of little value. Painful micturition, for example, may be just as severe with renal tuberculosis alone as when ureter and kidney both are diseased. Objective symptoms may be of great assistance. If the ureter is considerably involved cystoscopic examination and ureteral catheterization or exploration furnish much information. The "golf hole" appearance of the ureteral mouth is positive evidence of a well-advanced tuberculous involvement of the ureter, the depression being the result of a much thickened and shortened ureter. The amount of obstruction to the catheter as it is passed up into the ureter is evidence of occlusion by débris or ureteral thickening and determines to some extent the degree of tubercular invasion. Ureteral catheterization it must also be remembered may be misleading, as when there exists certain congenital ureteral abnormalities, as for instance, a Y-shaped ureteral tract. Here the X-ray after an injection of some silver salt through the common ureter may locate the point of bifurcation. The median transperitoneal approach

becomes a valuable diagnostic means, as under these circumstances the thickened ureteral tract is easily distinguished intra-abdominally, and catheterization per abdomen can even be done to determine the source of disease if considered necessary.

When the vesicovaginal portion of the ureter is affected, digital examination per vaginam reveals a thickened cord extending along the anterior wall from the base of the broad ligament to the neck of the bladder.

In determining the source of tubercular involvement, whether in the right or the left kidney, too much importance should not be given to a single symptom; for example, pain, a symptom upon which the patient with renal tuberculosis usually lays great stress, may be located in the opposite region to that affected.

On digital examination thickening of the vesicovaginal portion of both ureters may be discovered yet the examination of the urine from one side only may show pathologic changes. This is usually so when the bladder mucous membrane has undergone thickening as the result of a prolonged irritation from the secretion of the diseased kidney. This point is well illustrated in Case 6.

It is of interest to observe that in only one of the six cases here reported was tubercle bacilli discovered in the urine, and in this case not until twenty separate tests were made (Case 7). It may be further stated in explanation that on several occasions the same specimens were submitted to different pathologists.

Fig. 4, Case 2. Showing the ureter stripped of its cellular sheath, a part of which is seen attached to its distal end.

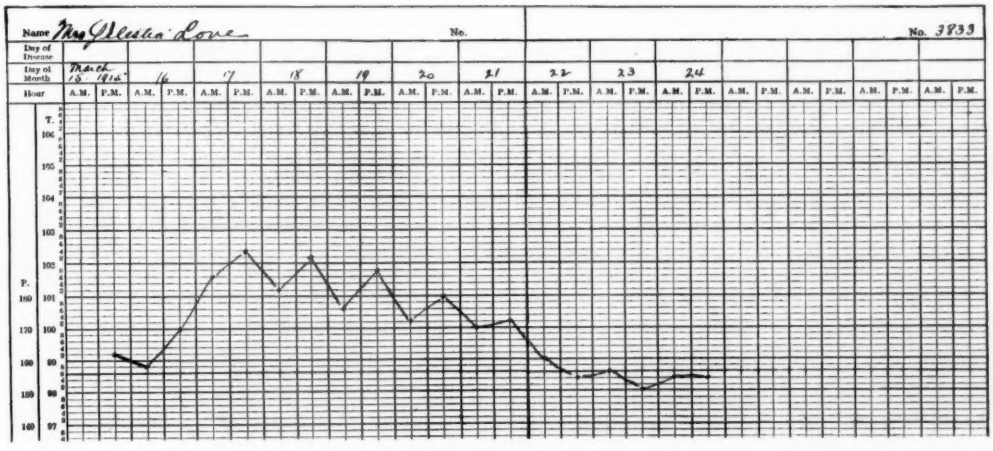

Fig. 3. Temperature chart, Case 2.

Fig. 6, Case 3. This photo also shows the ureter stripped from its cellular sheath, part of which is seen attached to its distal end.

While, therefore, the finding of tubercle bacilli in the urine associated with certain characteristic symptoms is corroborative evidence, their absence does not make the diagnosis negative. Symptoms commonly associated with renal tuberculosis and the presence of pus are, as a rule, sufficient for a diagnosis.

The mucosa is of course the first structure invaded by the bacilli, and in the majority of cases it is alone involved. The muscular coat is not so commonly invaded. Though the fascial sheath may at times be involved in the tubercular process, the thickening of the sheath must not be interpreted as positive evidence of tubercular invasion, for the law common to all connective tissue when in close proximity to an inflammatory process is applicable here as elsewhere. The extent of the invasion in the different layers which constitute the wall of the ureter can, however, be determined only by microscopical examination.

Our present knowledge of the subject therefore leads us to the conclusion that when the kidney is tubercular the ureter in the majority of cases is in part of its course, and usually in greater part, likewise involved, and that the most common site of involvement is the lower rather than the upper part. Also that when the kidney alone is removed the success of the operation is often jeopardized (Cases 6 and 7).

It is to be admitted that if the vesicovaginal portion of the ureter be left, it becomes a possible source of progressive pathological disturbance, but in view of what has been pretty well established, namely, that the lumbar and pelvic portions of the ureter are the

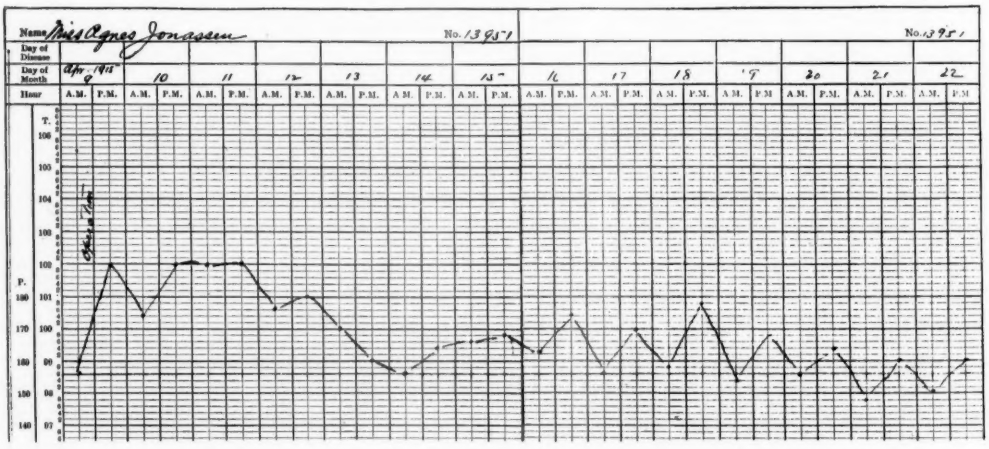

Fig. 5. Temperature chart, Case 3.

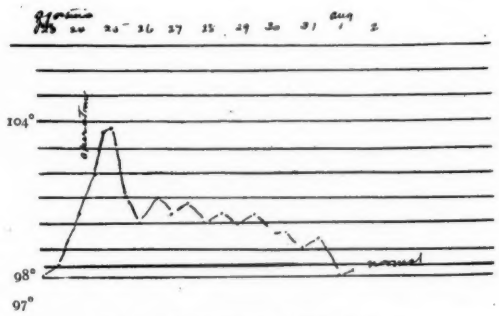

Fig. 7. Temperature chart, case 4.

sources of greatest possible danger, they should receive primary surgical consideration. The advisability of removing the vesicovaginal portion of the ureter simultaneously with the removal of the kidney and the rest of the ureter is however debatable.

The routes which have been adopted for the removal of the kidney and its ureter are: (1) retroperitoneal, (2) transperitoneal, (3) retroperitoneal and transperitoneal, (4) retroperitoneal and vaginal, (5) retroperitoneal, transperitoneal, and vaginal. The retroperitoneal route is the one commonly adopted, but by it the ureter is frequently removed only in part and its remainder variously disposed of as follows: (1) the removal of a small portion of the ureter with the kidney, ligation, sterilization of its cut end and leaving of the remaining portion *in situ;* (2) the removal of a small portion with the kidney, the injections of several minims of a 95 per cent carbolic acid solution into the remaining ureteral canal, ligation, and leaving of the ureter *in situ;* (3) the removal of a small portion of the ureter with the kidney and stitching of the remaining cut end in the lower angle of the wound; (4) the removal of as much of the ureter as can be reached through the original incision or a combination of incisions, ligation, and sterilization of the cut end.

The technique of the combined transperitoneal and retroperitoneal routes herein advocated is as follows: The abdominal cavity is entered through a median incision 7 cm. or more in length, between the umbilicus and the symphysis. The patient is put in the Trendelenburg posture and the intestines forced

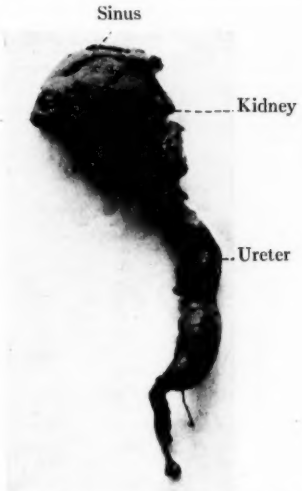

Fig. 8, Case 4. This photo shows the lumbar sinus, the shell of kidney previously operated on and ureter in continuity.

into the upper abdomen and kept there, thoroughly protected by moist gauze pads. The pelvic organs are now examined and any lesion or abnormality discovered, corrected. To facilitate the exposure of the field and the manipulation of the ureter, a temporary catgut suture is passed through the posterior uterine wall near the juncture of the corpus and cervix. When traction is made upon this suture, the fundus is lifted up to the pubic arch and the cervix is removed from the field of vision. Another preliminary step with much the same object in view is to pass a temporary suture through the ovary of the side affected, then through the abdominal wall or outer portion of the round ligament. When this suture is tied the ovary and tube are also lifted out of the field of vision. If the ureter of the right side is diseased, its entire pelvic portion can be plainly seen passing over the pelvic brim and coursing downward to the base of the broad ligament, near the cervix. The peritoneum and the underlying fascial structure is now grasped with forceps immediately to the outer side of the ureter as it passes over the brim of the pelvis and an incision made into the loose cellular structure; this incision is continued downward to within 1 cm. more or less of the cervix, and

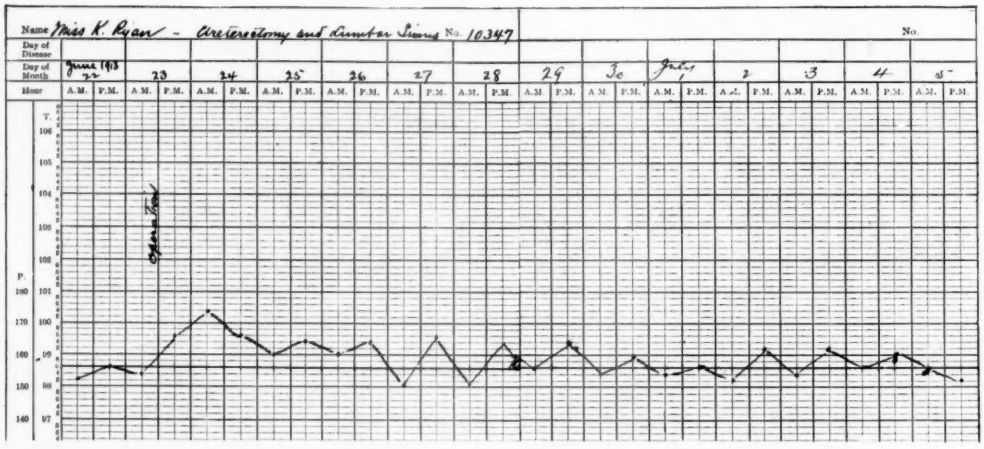

Fig. 9. Temperature chart, Case 5. Considering the extent of surgical work done in these combined transperitoneal and retroperitoneal operations, the temperature charts show a favorable comparison with the average transperitoneal operation alone.

upward, if desired, to the base of the cæcum. Beginning at the brim of the pelvis a blunt dissection or enucleation of the ureter from its surrounding tissues is made with the finger. To facilitate this a heavy suture material or a narrow strip of gauze is passed under the freed portion of the organ immediately above the promontory. Gentle traction on this furnishes sufficient resistance to facilitate greatly the separation of the ureter down to and beyond the uterine artery. The uterine artery is as a rule distinctly seen, it is usually not necessary to disturb it more than to separate its cellular connection with the ureter and to tie a small arterial branch which enters here the fascial sheath of the ureter. A chromic catgut suture, No. 1, is now passed around the ureter and tied below the uterine artery, which step can be done by this technique with exactness and comparative ease. The ureter is now grasped with a curved artery forceps at a point 1 cm. above the tie; before severing the ureter between the forceps and the tie, a piece of gauze is placed in the cellular bed immediately below to prevent a possible contamination of this field. On severing the ureter both cut ends are treated with carbolic acid and alcohol and the gauze removed. The proximal cut end being now pulled up out of the wound, is tied very tight and again after the forceps is released so as to prevent any possible escape of ureteral contents when the kidney and ureter are manipulated in their removal through the lumbar incision. On freeing the forceps the crushed portion of the canal is opened and sterilized with carbolic acid and alcohol. Gentle traction is now made on this freed pelvic portion of the ureter while blunt dissection with the finger is continued upward along the ureteral tract to the immediate region of the kidney. In the retroperitoneal space thus created above the pelvic brim the freed ureter is placed, folded on itself, and the rent in the peritoneal and fascial structure closed with a continuous plain catgut suture. When the left ureter is the seat of disease the technique is practically the same, excepting that the dissection is made under the sigmoid, preferably from above down. When the enucleation is completed and the ureter severed, this freed portion is pulled up from under the sigmoid. In this way the lumbar portion of the ureter is more easily reached and can be freed as high up as desired.

The abdominal incision is now closed and the patient turned upon her stomach and a lumbar incision made from a point immediately above the last digitation of the serratus posticus inferior down to a point immediately

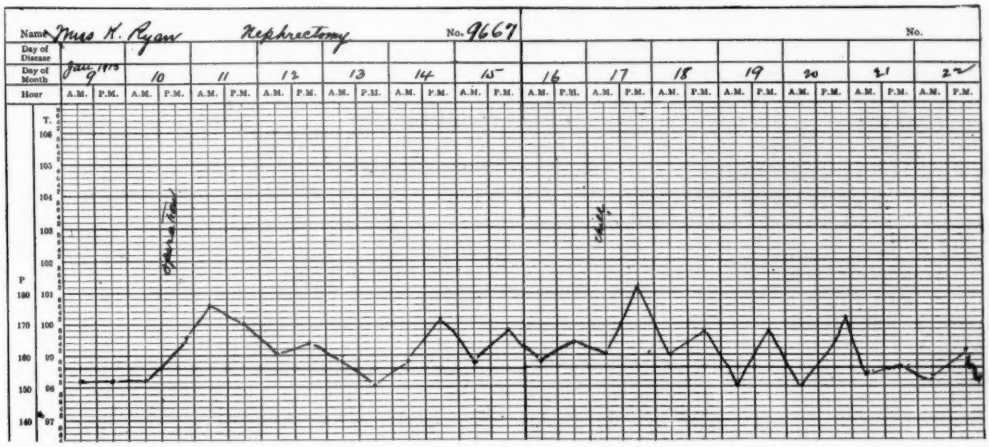

Fig. 10. Temperature chart, Case 7.

above Petit's triangle. This incision is practically parallel with the insertion of the latissimus dorsi along the lumbar fascia. The latissimus dorsi is exposed and severed along its line of insertion and drawn to the outer side of the wound, thus exposing the underlying lumbar fascia. An incision is next made through the lumbar fascia in the upper angle of the wound, parallel to and immediately below the under border of the last rib. As the last dorsal nerve is usually less than 1.5 cm. from the rib, the importance of keeping close to the lower border of the rib is apparent. As this incision brings us to the outer side of the nerve, and as the nerve in its course downward tends in the general direction of the symphysis pubis, an extension of the incision downward through the transversalis and internal oblique muscles can be continued with but little fear of injury to the nerve. The incision can be extended upward without injury to the nerve by following closely the lower margin of the rib.

The incision through the lumbar fascia immediately below the rib exposes the transversalis or intra-abdominal fascia about where it splits to form the fascial capsule of the kidney. The line of demarcation between the dark yellow or subperitoneal fat and the light canary colored or intracapsular fat is distinctly seen. As the kidney is approached through an incision made in the posterior layer of the fascial capsule the danger of entering the peritoneal cavity is avoided.

The average tuberculous kidney, though larger than normal, can usually be delivered, upper pole first, through a fascial and muscular incision 7 cm. in length; but when the kidney has increased very much in size or the inflammatory process has been sufficiently extensive to affect the perirenal tissues with resulting fixation of the kidney, the incision should be lengthened and the kidney delivered by the pole most convenient. After delivery the fatty tissue is carefully separated from the fibrous capsule of the kidney, not only from the anterior and posterior surfaces but also from about both poles down to the hilus.

At this stage of the technique of nephrectomy it is usual to apply one or two powerful clamps to the kidney pedicle, sever and tie. The objections to such a procedure are that if the ureter is thick, the forceps fail to grasp the vessels and they slip through the blades to the great discomfiture of the operator and often danger to the patient, also crushing or severing the ureter in nephro-ureterectomy is undesirable and unnecessary.

Where it is possible, and in most cases it is, I prefer the following technique in removing the kidney. The ureter and the renal vessels are surrounded by a fascial covering which is

a continuation of the fascial capsule of the kidney; this covering with the fat commonly found about the pedicle is stripped away from ureter and vessels. The ureter and vessels are thus clearly defined and the finger is passed between to separate them, so that there may be no possible chance of ligating them together. The ligation of the vessels is preferably made with a double ligature, No. 2 plain catgut, passed between them and tied twice on each side. The kidney is now cut away from its vessels close to the concave margin. No forceps are here necessary as the contents of the renal pelvis cannot escape through the blood-vessels. We now have the ureter alone to consider. If the fascial covering of the ureter is very thick it is significant of tuberculous change in it and should be entirely removed with the ureter. If it is not very thick the ureter may be easily peeled out and as much of the capsule cut away as thought necessary. When the former method is followed the finger is forced into the bottom of the wound to locate the coiled up free end of the ureter, the tissues between it and the finger are severed and the ureter pulled through. Freeing of the remaining attached portion is now easily accomplished and both organs are removed intact. When the latter method is followed the line of cleavage between the fascial covering and the ureter proper is easily followed and the stripping can be continued down to the ligated cut end of the ureter. At this stage the ureter and sheath resemble the inverted finger of a glove as the finger of the hand emerges from it, and as much of this fascial covering is cut away with the ureter as thought necessary and the kidney with its ureter removed.

As there is no contamination of the wound and no hæmorrhage, drainage is not necessary. The lumbar incision is closed, layer by layer, with plain catgut No. 1, care being used while suturing to avoid injury to the last dorsal nerve.

The advantages of the median transperitoneal route for dislodging, freeing, and releasing the pelvic portion of the ureter are applicable to both the male and the female. These advantages are, however, greater in the female than in the male, which fact is readily appreciated when we compare the anatomical relationship of the pelvic organs in the sexes. In the male the ureter passes down along the pelvic wall, without encountering an important structure not common to both sexes until it reaches the bladder region. In the female the ureter passes along the base of the broad ligament and under the uterine artery before it reaches the bladder, making the uterine adnexæ play an important part in the problem of surgical approach to the ureter. Because of this relationship the complete removal of the pelvic portion of the ureter in the female by any of the retroperitoneal methods is difficult and may prove dangerous. Moreover, when the ureter is removed through an extended lumbar incision, an incision to the outer side and parallel to the rectus or through a combination of incisions as advocated by Kelly, there is an extensive surgical invasion of tissue, tissue filled with important nerves and blood-vessels, which when injured often result in great discomfort and even permanent distress to the patient. When the combined route as described and advocated in this paper is adopted there is resulting a minimum destruction of tissue and the least possible risk of injury to nerves and blood-vessels.

The sharp angle which the ureter follows as it curves over the brim of the pelvis, the depth of the pelvic cavity and the unyielding bony walls which it closely follows are responsible for much of the difficulty encountered in enucleating retroperitoneally the complete pelvic portion of the ureter. The median transperitoneal route, on the other hand, permits of direct approach and unrestricted access, and when pelvic complications exist, recognized or unrecognized, previous to operation, they can be immediately corrected to advantage. When unrecognized inflammatory pelvic lesions in the vicinity of the ureter exist, particularly when pus collections are formed and the subperitoneal tissues are involved, the risk to life by enucleating the ureter retroperitoneally is much increased, as under these circumstances there exists the possibility of rupture of the pus sac, tearing into and infecting the peritoneal cavity.

Therefore, retroperitoneal surgery of the pelvic portion of the ureter in the female

should be condemned as it is at best blind surgery and does not afford the safeguards at our command.

As many tuberculous kidneys are found prolapsed, an abnormality which may enter as a possible factor in the causation of the tuberculous invasion, the question of position is to be considered. If the kidney is found resting in the false pelvis and not fixed by inflammatory exudate, it should be removed with the ureter through the median transperitoneal incision as its pedicle is easily accessible and the risk of infecting the peritoneum from the kidney contents is practically nil.

If by digital examination *per vaginam* or cystoscopic examination and catheterization there is discovered evidence of tubercular invasion of the ureter, nephro-ureterectomy should be the operation of choice. If previous to operation no evidence of ureteral involvement has been discovered, nephrectomy alone should be the operation selected, but if, when the kidney is removed, there is discovered evidence of tubercular invasion in the upper portion of the ureter, the removal of the entire ureteral tract is justifiable, as it is reasonable to suppose that the remaining portion is involved.

If the immediate removal of the ureter is considered desirable, as much of the ureter should be removed with the kidney through the lumbar incision as can be conveniently reached, and then the patient turned upon her back and the pelvic portion removed through the median transperitoneal incision.

If the ureter is left, secondary ureterectomy will depend upon such sequelæ following operation as persistent intra-abdominal pain or distress, invalidism or incapacity for work as the result of a persistent lumbar sinus or painful and frequent micturition. Secondary ureterectomy with or without its accompanying sinus is done almost universally retroperitoneally, but practically the same objections are applicable to its removal by this route as are applicable to the removal posteriorly of the tuberculous ureter and kidney. The transperitoneal combined when necessary with the retroperitoneal route are the routes of choice.

It is to be admitted that many of the arguments hold good respecting the desirability of immediate elimination of the vesicovaginal portion of the ureter when nephrectomy is performed for tuberculosis, which hold good respecting the desirability of removing the lumbar and pelvic portions. There are, however, objections to the immediate removal of the former which do not exist, or exist to a lesser degree, to the removal of the latter, i.e., that its removal makes the operation considerably more complicated and introduces an element of possible peritoneal infection through the vaginal canal. Again, if the vesicovaginal portion is not removed its subsequent history can be easily followed, and when found to be a continued source of disturbance can be removed *per vaginam* at a selected time. The dangers of its removal primarily or secondarily are a resulting vesicovaginal fistula and injury to the uterine artery. Both accidents can be avoided, however, by first carefully separating the anterior vaginal wall from the bladder wall, and when the bladder wall is not itself diseased, which would demand its removal with the ureter, the sheath of the ureter can be cut open lengthwise and the ureter proper peeled out. When the operation is immediately done following the removal of the kidney and remaining portion of the ureter, the catgut which encircles the ureteral cut end under the uterine artery may be passed through the vaginal vault into the vagina and will aid materially in directing the work and in preventing accident to the uterine artery.

It is difficult to draw correct conclusions from statistics regarding the relative dangers of comparative operations, as no two cases are alike and operators vary in skill. Statistics may be serviceable, however, in generalizing. The mortality in nephrectomy is between 2 and 3 per cent. If nephro-ureterectomy can show a mortality no greater its objection or disadvantage from this standpoint is not to be considered. Of the five cases reported in this article operated on through the combined route, three were nephro-ureterectomies, one ureterectomy with a degenerated kidney and lumbar sinus, and one ureterectomy with a simple lumbar

sinus. The mortality from operative work was nil. One case died six weeks after from hæmorrhage of the lungs, having had a pulmonary tubercular involvement complicating her case.

Morbidity as the result of nephrectomy for tuberculosis of the kidney is more or less frequent, but from nephro-ureterectomy as herein described it has been nil. Symptomatic results were ideal in every case.

The argument used in opposition to the combined transperitoneal and retroperitoneal routes, that the resulting shock is severe and the consequent risk is out of proportion to the advantage offered, is not a valid objection, as is shown when reviewing the post-operative histories of the following cases.

CASES IN WHICH THE URETER AND KIDNEY WERE REMOVED AT THE SAME TIME

CASE 1. M. F., aged forty-nine.

Chief complaint: Frequent and painful micturition.

Family history negative with respect to tuberculosis.

Menstrual history normal until one year ago. Has not menstruated for four months. Married twenty-six years; six children; two dead, one of tuberculosis, one at the age of five months of spinal meningitis. Illnesses: pleurisy seventeen years ago. Operated upon for fistula *in ano* when twenty-five years of age.

Present symptoms began June, 1912. Burning micturition, increasing in frequency and distress. Small quantities every twenty minutes. More frequent at night. No blood seen in urine.

Maximum weight 163 pounds. Minimum weight 150 pounds.

Physical examination. General appearance good, well developed, and nourished; somewhat anæmic. Thorax: Heart accentuated second over apex and pulmonary with slight systolic blowing over apex. Lungs: Respirations limited in lower left and breath sounds diminished over whole left lung. Abdomen: Right kidney low, enlarged, somewhat tender; left kidney movable, two-thirds palpable; liver two fingers below costal margin; spleen palpable. Genital organs: Uterus retrodisplaced; adnexæ normal.

Cystoscopic examination (by Dr. Osgood). Capacity of bladder 3½ ounces. Cystoscope shows marked thickening, redness, swelling, roughness, and ulceration of right side of floor and posterior wall. Right ureter mouth is a rounded cavity, deep red, situated posterior and external to its normal location, i.e., ureter is retracted. Ureter mouth is ulcerated and bleeds on slightest touch. Cannot be catheterized. Thick, turbid fluid is ejected from it. From appearances a right renal tuberculosis is suspected. Left side and left ureter normal. Left ureter easily catheterized, urine normal in flow and appearance, only slight trace of albumin.

Microscopic examination of bladder contents shows occasional clumps of pus-cells. Culture negative.

Operation, November 25, 1912. Abdominal findings: Uterus retroverted, freely movable. Appendages normal. Appendix and gall-bladder normal (?). Right ureter enlarged along whole length to size of index finger. Right kidney prolapsed, enlarged. Left kidney movable. Left ureter normal.

Ureterectomy. Laparotomy, median abdominal incision. Ureter dissected out to base of bladder where it was ligated and stump cauterized. Proximal free end of ureter pushed up under cæcum and ileum. Peritoneal incision closed.

Nephrectomy. Lumbar incision. Enlarged kidney, short pedicle. Renal vessels tied off with plain catgut. Kidney and ureter removed intact.

Pathological report. Macroscopic examination. Kidney 12 x 6 cm. Capsule thickened, adherent. On section, several cubic centimeters of thin pus escapes from pelvis. Calices enlarged. Mucosa granular, shows many pale tubercles. Papillæ absent from many calices. Kidney parenchyma pale. Cortex not reduced, many tubercules about 1 mm. in diameter are scattered through kidney substance especially at cortex.

Ureter 2 cm. thick, 20 cm. long.

Microscopic examination. Albuminoid degeneration throughout entire parenchyma. Few foci of lymphoid cells under capsule. No other changes in cortex. In pelvis is a large area of caseation and a few small tubercles with giant cells. Ureter diffusely thickened, converted into epitheloid tissue with tubercles.

Anatomical diagnosis. Tuberculous pyelitis. Diffuse tuberculosis of ureter.

Laboratory. Urine before operation: Yellow, heavy white precipitate, cloudy, acid, heavy trace of albumin, no sugar. Pus culture negative. No tubercles found. After operation: Amber, smoky, white precipitate acid, 1,022. Very heavy trace of albumin. Hyaline and granular casts, pus. One month post-operative: Faint trace of albumin, a few pus-cells. Sputum one week after operation shows tubercle bacilli.

Course after operation. Good immediate recovery, urinary symptoms were immediately relieved. Wounds healed primarily. Bloody sputum showing tubercle bacilli increased, and she died of a pulmonary hæmorrhage six weeks after operation.

CASE 2. C. L., age thirty-five.

Chief complaints: Pain in right kidney region, painful and frequent micturition.

Family history. Mother living, was operated on for uterine cancer.

Menstruation negative until six months ago; since then flow is scant.

Marital: Married eight years. No pregnancy. Husband has pulmonary tuberculosis.

Present symptoms. Known to have low, movable right kidney for five years. In November, 1914, had severe attack of pain in right kidney region, three days in bed. Second attack in February, 1915; pain began at pubes and traveled upward toward kidney, lasting one week, not as severe as previous pain, and she was not confined to bed. At this time tubercle bacilli were reported found in urine, by her physician. Kidney has grown large and is very tender on pressure. Increased micturition for past year; has passed 72 ounces in two urinations, no blood.

Cystoscopic examination (by Dr. Bugbee). March 4, 1915: Urine cloudy, trigone congested, especially about right ureteral orifice. Mucous membrane bleeds easily. Right urine cloudy, left urine amber colored.

Ten days after the first cystoscopic examination an effort was made to again pass the catheter with the object this time of securing an X-ray of the position of the kidney, it being quite low, but the ureter had within this short time become so occluded by increased thickening and debris that the passing of the catheter was impossible.

Maximum weight 115 pounds three weeks before operation. Tires easily.

Clinical pathology. Urine yellow, cloudy, acid, 1,026, albumin, heavy precipitate, no sugar. Microscopic: Casts, large amount of pus.

Operation, March 16, 1915. Ureterectomy. Median abdominal incision. Uterus found anteverted. Left ovary and tube firmly adherent to the pelvic wall and broad ligament. Fimbria of tube so adherent to the pelvic wall as to be completely occluded and when separated a small opening was discovered and stretched. Right ovary and tube still more damaged as the result of inflammatory process. Both organs were firmly adherent to the peritoneum about the enlarged ureter. The fibræ were practically destroyed and the tube should have been removed, but because of the urgent request of the patient "to save everything that could possibly be saved" it was left, after having opened its extremity and dilated it. The appendix was much enlarged and showed evidence of inflammatory action. It was firmly adherent to the peritoneal covering of the thickened ureter throughout its entire length. It was removed. The right ureter was greatly thickened throughout its entire course; dissected from its bed to a point below the uterine artery, cut away, cauterized, proximal free end tucked under the cæcum and ileum; pelvic peritoneal incision closed. Abdominal wound closed.

Nephrectomy. Lumbar incision, renal arteries and veins isolated and tied with plain catgut, ureter isolated. Kidney with its ureter attached removed.

Pathological report. Macroscopic examination. Kidney slightly larger than normal. Surface shows numerous hæmorrhagic adhesions on both poles. The pelvis of the kidney is slightly dilated. The ureter is 2 cm. long and measures about 7 mm. in diameter. The kidney substance is rather pale. There are numerous small white spots distributed all over cortex. The wall of the ureter is thickened. The lower portion of ureter contains cheesy pus.

Microscopic examination. Several sections of the ureter show that the mucosa is greatly swollen. There are no epithelial elements anywhere in the plicæ of the ureteral mucosa. The entire stroma as well as the muscular wall of the ureter shows extensive centers of coagulation necrosis as well as typical giant-cell tubercles. Dense round-cell infiltration is especially characteristic of the folds of the mucosa. Section of the kidney shows that the cortex as well as the ampullary portion contains numerous typical epithelioid cells and giant-cell tubercles with necrotic and infiltrated portions. There are casts of a number of tubuli uriniferi. The lesions are very extensive throughout the entire organ.

Diagnosis. Tuberculosis of the kidney and of the entire ureter.

Post-operative history. Recovery uneventful, out of bed on the fourteenth day. Primary union of wounds. All symptoms relieved.

Cystoscopic examination, April 8, 1915. Mouths of both ureters seen, little congested. Bladder normal.

Present history. Well and gaining rapidly. Capacity of bladder now normal. Vaginal examination eight weeks after operation showed marked diminution in size of the vesicovaginal portion of the ureter. Vaginal examination six months after operation showed no appreciable thickening of the vesicovaginal portion of the ureter.

CASE 3. Miss A. J., age twenty-five.

Chief complaints: Pain in right kidney region, frequent and painful micturition.

Previous history. Menstruation, onset at fifteen, profuse, seven days, no pain, regular. General health good.

Present symptoms. On November 26, 1914, had severe attack of pain under right costal margin, behind. Felt very ill for twenty-four hours. Did not vomit or have fever. Next attack in January, 1915, lasting one hour, followed by sore feeling in right side. December 25 to present time has had pain in bladder, very frequent and painful micturition. Never has passed blood in urine. Has had two other attacks, one in February, the other in March. Last attack, duration one hour, accompanied by vomiting. Right side tender on palpation. Lost 12 pounds from December 25 to March 26.

Physical examination negative.

Cystoscopic report (by Dr. Bugbee). Urine right side cloudy. Trigone and area about mouth of right ureter congested. Mucous membrane bleeds easily.

Pathological laboratory report on urine: Light

yellow, cloudy, acid, 1,015, albumin heavy, cloudy, no sugar, large amount of pus.

Operation, April 9, 1915. Ureterectomy. Median abdominal incision. Pelvic organs normal. Appendix removed. Left ureter normal. Right ureter throughout its entire course greatly thickened. Freed from its bed and severed below the uterine artery. Proximal free end tucked under cæcum and ileum. Pelvic peritoneal incision closed. Abdomen closed.

Nephrectomy. Lumbar incision, renal vessels tied with plain catgut, ureter isolated and kidney and ureter removed together.

Pathological report. Macroscopic examination. Kidney, weight 210 grams with ureter, 200 without ureter; dimensions 12½ x 6½ x 4 cm.; ureter 20 cm. long, largest diameter 1 cm. which is in the lower one-third; smallest diameter 4 mm. at the junction of the upper and middle one-third. Fatty capsule removed, true capsule peels smoothly except on upper pole, where it is somewhat adherent. At this place there are subcortical typical hæmorrhages and yellowish areas representing local abscesses. These cover an area of about 1½ cm. in diameter. On section the pelvis shows irregular areas of erosion with raised outline and yellowish color. One of the pyramids is diffusely eroded, forming a crater about 2 cm. in long diameter. This represents the apex of the infected zone which goes out in cone-shaped manner to the cortex of the kidney. The ureter is diffusely thickened, especially in its lower one-third. One section is taken from near the peripheral extremity, a second section from the constricted area of the middle one-third. The contents of the pelvis are thick, creamy pus. The pelvis is somewhat dilated. Section from the pelvis.

Microscopic examination. Section of kidney shows a cortical region with many minute tubercles of typical formation, then comes a wedge-shaped area of diffuse tuberculosis where the tubules are entirely destroyed. The apex of this region is toward the pelvis, and shows remains of the straight tubules.

Section of the ureter in the peripheral region shows a diffuse destruction of the mucosa, replacement by lymphoid cells and a few giant cells. The section from the middle constricted region shows an intact epithelium, but some lymphoid infiltration of the submucosa.

Diagnosis. Tuberculous pyelonephritis and ureteritis, universal.

Post-operative history. Convalescence uneventful. Primary union of wounds. Symptoms relieved.

Cystoscopic examination, three weeks after operation, shows the urethra hyperæmic, the sphincter hyperæmic, the fundus of the bladder normal, an area of hyperæmia at the site of right orifice, and several minute grayish nodules scattered through the base of the bladder. Capacity seven ounces. Clear urine from left kidney. Left orifice normal.

Vaginal examination. Nine weeks after operation: The vesicovaginal portion of ureter had diminished so in thickness that it was with difficulty determined; absolute relief of all symptoms.

CASES IN WHICH THE REMAINING TUBERCULAR URETER AND LUMBAR SINUS WERE REMOVED AT THE SAME TIME

The following two cases are of especial interest because they are of a class which has not received the surgical attention it deserves, although suffering equally if not more than the cases with tuberculosis of the kidney pure and simple.

CASE 4. M. A., age twenty-nine.

Present symptoms. Vesical pain and hæmaturia. Severe pains in both kidney regions referred along ureters to pelvis. Prefers to sleep on her back but rests more comfortably on left side than on right. Constant and distressing discharge in lumbar region from old renal sinus.

Previous history. Had fracture of right hip when quite young. Later right femur became tubercular. Five and one-half years ago was operated upon at a hospital for tuberculosis in right kidney and tuberculous femur. Femur was cured but left deformed. Kidney was opened and drained. Menstruation, onset at fourteen. Regular, two and one-half days, moderately painful. Last, one week ago. No children, no miscarriages.

Family history. All members of her family have tuberculosis.

No physical examination recorded other than that her general appearance was "fair."

On admission her temperature was 99.2, pulse 72, respirations 22. Urine on admission very dark, amber, acid, heavy cloud of albumin, no sugar. Microscopical examination negative except for red blood-cells and squamous epithelial cells, also leucocytes. On day after operation urine was reported "cloudy, amber, 1,018, acid, trace of albumin, no sugar. Red blood-cells, hyaline casts, and squamous cells." No report of examination for tubercle bacilli; no report of cystoscopic examination. Seventeen days after operation urine reported "colorless, alkaline, 1,002, no albumin, no sugar, no sediment."

Operation. Median abdominal incision. Abdomen opened and explored; appendix normal, left kidney low. Remains of right kidney high under ribs. Right ureter greatly enlarged, in places to the size of a thimble. Ureter was dissected out under broad ligament to base of bladder, ligated, and freed above plevic brim where it was tucked beneath the colon. The peritoneum was then sutured over old bed of ureter. Abdomen then closed in usual manner.

Then through scar of previous operation on right kidney, incision was made down to remainder of kidney. Kidney was very small and chiefly a wall surrounding an abscess of caseous material and

serous fluid. Also no apparent blood supply to pelvis of kidney (this had probably been destroyed at previous operation). Kidney structure and remains of ureter removed, bleeding points ligated and wound packed with three strips of one-half inch iodoform. Wound closed in usual manner.

Pathological report. Macroscopic examination. Irregularly shaped mass of tissue weighing 90 grams. Main mass contains many cavities and on section shows cystic cavities lined with pyogenic membrane. Ureter 17 cm. long attached, dilated, and filled with pus. Measures on section 2 x 1.7 cm.

Microscopic examination. Kidney: Areas of necrosis, round-cell infiltration, congestion. Areas of tuberculous tissue in which there appear to be giant cells. Parenchyma of kidney almost entirely replaced by these changes. Ureter: Thickening, round-cell infiltration, loss of mucosa.

Diagnosis. Tuberculous pyelonephritis.

Post-operative history. Condition good. Stormy convalescence for four days. Vomited a good deal. Convalescence thereafter uneventful. First twenty-four hours urine 3½ ounces; second twenty-four hours urine 8 ounces; third twenty-four hours urine 19 ounces. Abdominal wound healed by primary intention; lumbar, after several weeks. Relief of symptoms immediate.

Last report, one year after operation, patient in perfect health.

CASE 5. Miss K. R., age thirty-eight.

Family history negative.

Present symptoms. Painful and frequent micturition. Pain more or less constant, referred to course of right ureter. Pain worse when standing; comfortable when reclining. Distressing and constant discharge from ureteral sinus, lumbar region.

Previous history. Right kidney removed January 10, 1913, for tuberculosis, report of which is included among nephrectomies to be reported (Case 7). Persistence of symptoms for over five months made her seek relief again.

Ureterectomy, June 23, 1913: Median abdominal incision. Ureter found greatly thickened throughout its entire course. Freed from its bed, severed below the uterine artery, proximal end tucked under cæcum and ileum, pelvic peritoneal incision closed. Lumbar incision through scar of previous operation for nephrectomy. Tract of sinus dissected out down to ureter. Ureter and old tract removed together.

Pathological report. Macroscopic examination. Length 20 cm., average diameter 1.3 cm. On section large amount of cheesy pus escapes from dilated lumen, which, however, is almost completely clotted up with the sticky, purulent masses.

Microscopic examination. Ureteral wall thickened with lymphoid infiltration which entirely replaces the mucosa. The wall itself shows many typical giant cells.

Diagnosis. Tuberculous ureteritis.

Cystoscopic examination, June 28, 1913 (by Dr. Bugbee). The bladder retains four ounces of fluid with some discomfort. The fundus of the bladder is normal. The right ureteral orifice is closed. About it for an area of 2 cm. is a slightly hyperæmic area containing several cicatrices. The blood-vessels are scarce in this area. The bas-fond in the median line has a similar appearance. The left ureter is normal, clear urine is evacuated at regular intervals. The area of the vesical neck and posterior urethra shows moderate œdema.

Post-operative history. Abdominal wound healed primarily, lumbar wound after five weeks. Convalescence uninterrupted. Symptoms immediately relieved. Left the hospital weighing 117 pounds. On May 20, 1915, when last examined, weighed 169 pounds, enjoying perfect health. Vaginal examination showed no thickening of the vesicovaginal portion of the ureter.

Cystoscopic examination (by Dr. Bugbee). Bladder retains four ounces. Mucous membrane healthy throughout. Left ureteral orifices normal. Clear urine is discharged at frequent intervals. (Bugbee.)

One of the particularly interesting features of this case is that at the time of her last operation the capacity of her bladder was only four ounces, the walls being damaged by inflammatory action. The bladder capacity at present is just the same as before but the appearance of the bladder is entirely different, and although she cannot hold more than four ounces and frequent micturition persists, yet she does not suffer and is perfectly comfortable except when the bladder is full.

CASES IN WHICH THE KIDNEY WAS REMOVED AND THE URETER LEFT WITHOUT RELIEF OF SYMPTOMS

CASE 6. M. C., age thirty-seven.

First examined September 1, 1907. Symptoms: Frequent and painful micturition, with pus and blood. Pain in right lumbar region and at times severe along ureteral tract. An X-ray showed stone in the pelvic portion of the right ureter.

Vaginal examination showed a large, thickened ureter along the anterior vaginal wall.

On September 10, 1907, a median abdominal incision was made. The ureter found thickened throughout its entire course, and a phosphatic stone filling the lumen of the ureter was removed from the middle of its pelvic portion. A ureteral catheter was passed through the opening made for the removal of the stone into the pelvis of the kidney and three ounces of urine containing pus was withdrawn.

Examination by two pathologists failed to reveal tubercle bacilli in either specimen.

Removal of the stone did not relieve symptoms, so it was decided to remove the kidney. October 29, 1907, right nephrectomy was performed. Drain-

age placed at the stump of ureter. Immediate recovery, no sinus. Nephrectomy relieved only the distress in the right side. Painful and frequent micturition continued as before. Bladder was injected with gumenonal followed by argyrol and later by iodoform emulsion 5 per cent.

Macroscopic examination. Kidney 8½ x 5½ x 4 cm. On section very fibrous. Nothing found in calices or ureter.

Microscopic examination. Section of kidney cortex. Tufts have largely disappeared. Coalescence of tubules. Areas of leucocytes and infiltrations of red cells; scattered tubercles with giant cells.

Diagnosis. Tuberculosis of kidney.

Three years after she was again examined. The bladder, irritable and painful, was in exactly the same condition, its capacity being only two ounces. The ureter could be felt along the vaginal wall just as thick as before operation. The left ureter was catheterized, normal urine secured from the left kidney. At the time of her death from pneumonia, seven years after, bladder symptoms remained the same.

It is my opinion that had ureterectomy also been performed the bladder conditions would have been materially altered, as occurred in the following cases:

CASE 7. Miss K. R., age thirty-eight.

Previous history. Operated upon by Dr. J. Riddle Goffe, December 7, 1912, at which time numerous small fibroids of the uterus were removed; uterine ligaments plicated for the correction of a displaced uterus. Stomach fixed to the abdominal wall for gastroptosis. Symptoms of painful micturition persisting, further investigation disclose a tuberculous lesion of the kidney. The patient was kindly placed under my care.

Cystoscopic examination, December 19, 1912. Left ureter mouth normal. Right ureter mouth is a red excavation through which dense clouds of turbid and red fluid escape at intermittent periods. Floor of bladder is œdematous and lumpy.

Right nephrectomy, January 10, 1913, done as heretofore described.

Pathological report. Macroscopic examination. Kidney with short ureter stump. Cystic cavities in either pole. *Microscopic examination.* Capsule thickened diffuse cloudy swelling of the epithelium. Large areas of epithelioid and lymphoid infiltration with a few definite tubercles.

Diagnosis. Tuberculosis of kidney.

Neither of the two last cases were relieved by nephrectomy, and a contrast of their subsequent histories is of interest. In Case 6 we find that up to her death the vesical symptoms persisted and the walls of the bladder and ureter remained greatly thickened. In Case 7, a continued history of which is found in Case 5, the vesical symptoms were not only relieved after nephrectomy, but the bladder assumed a healthy appearance although its capacity remained the same. The thickening of the vesicovaginal portion of the ureter also completely disappeared.

PARTIAL OCCLUSION IN THE TREATMENT OF ANEURYSMS[1]

By EDWARD MARTIN, M.D., Philadelphia

FOUR years ago a man, aged forty years, while returning from a Labor Day picnic in that condition of ethyl exaltation appropriate to the occasion, received a dazing jaw-jolt, followed by no effect other than the customary transient lack of initiative. Two weeks later there developed a slowly progressive swelling of the right eye-lid, which in conjunction with a chemotic conjunctiva, a pulsating orbital content, and a subjective bruit, led him to consult an eye man, Dr. Risley, who referred him to Dr. John B. Deaver, who ligated his right common carotid artery, this being followed by an immediate lessening of his ptosis, a cessation of pulsation and bruit, and a prompt and permanent cure.

Two years and eight months ago a man, aged sixty-five years, fell downstairs. Seven months later he awoke from a troubled trance, deaf in his right ear, blind except to gradation of light, and harassed by a throbbing tinnitus; for the cure of these ills he consulted an eye man, Dr. Risley, who referred him to me. He was a high-pressure arteriosclerotic, with inadequate renal function, and presented a bilateral pulsating exophthalmos with everted lids, and thrill and bruit—more marked on the right side. Moderate pressure on the right common carotid controlled the pulsation thrill and bruit. Under local anæsthesia a doubled chromic catgut ligature, No. 2, was passed around the right common carotid and was tightened down till the orbital pulsation and bruit ceased, a feeble pulse being still felt to the distal side of the ligature. A prominent venous plexus in the orbit was also catgut ligatured. The man was given an injection of human serum, little fluid and less food; for two weeks being kept in bed and in a condition of cheerful resignation by the judicious use of morphine. A report written the last week shows a complete cure, and eyesight adequate for the reading of large print.

Five years and a half ago a man, then twenty-one years old, was struck senseless by a trolley, so remaining for a week with slow persistent bleeding from the nose and ear. For two months he exhibited left facial palsy and deafness in the ear of that side, and constantly then and thereafter anosmia and a loud, humming, buzzing sound in his head, not ceasing for even a fraction of a second, but with a throbbing, rhythmic accentuation. For the relief of the tinnitus he consulted Dr. Leopold, who sent him to me—he being then in the second year of his suffering. His left eye was moderately thrust forward. Over it, particularly in the upper orbital segment, were dilated pulsating veins; the eye-lid was a trifle ptosed, and the left external rectus was weak. A loud, ringing, short, sharp bruit could be heard, much like the sound made by tapping a sheet of steel with a hammer. This sound disappeared on making pressure over the left common carotid artery. By means of a tendon ligature, this artery was occluded till the sound ceased, though feeble pulsation of the carotid could still be felt distal to the tie—a mass of orbital veins was also catgut ligatured, and the general serum-starvation, care-free rest treatment already indicated was carried out. Two years later Dr. Leopold reported that the cure had been prompt, complete, and continuous.

The usual cause of pulsating exophthalmos is trauma (over 70 per cent, de Schweinitz and Holloway), and particularly that of sufficient severity to fracture the base of the skull.

The symptoms in their order of development are: throbbing bruit, distressingly audible to the patient, exophthalmos, dilated orbital veins giving pulsation and thrill, and failure in vision.

The ocular and orbital manifestations are bilateral in 10 per cent of the cases. Symptoms of intracranial hypertension are conspicuous by their absence.

[1] Read before the American Surgical Association, Rochester, Minnesota, June 9–11, 1915.

The diagnosis would seem obvious, yet of 40 autopsies collected by de Schweinitz and Holloway, certain rupture of the carotid into the cavernous sinus was proved in but 14. Six were tumors and 6 were aneurysms of the internal carotid or of the ophthalmic artery.

Aubaret, having ligated both carotids, conducted the logically, but not necessarily, sequent autopsy, finding no trace of aneurysm.

Van Dusen, after a bilateral ligature with reported betterment, demonstrated post-mortem a fibrosarcoma.

There is an unwritten history which would still more forcefully illustrate the possibility of diagnostic error. Hence a careful examination of the accessory nasal cavities, an interpretation of X-ray findings, with regard to the rapid bone erosion of new-growths, and an appreciation of the frequent thrill and of the noisier bruit of an arteriovenous aneurysm, would seem to be indicated.

The prognosis as to life seems good; as to vision bad, de Schweinitz and Holloway asserting that not more than 10.1 per cent have retained normal vision and that there is a pronounced defect in 50 per cent.

That a spontaneous, or perhaps, a traumatic cure may be accomplished they show by the case of a boy whose right common carotid and left internal carotid had been tied by Frazier with some betterment. More than two years later, as a result of butting a playmate, his bruit was lessened the same day, disappeared the next, and thereafter remained permanently well.

The treatment, unfortunately, cannot be conducted on those lines which Matas has so admirably formulated for the cure of accessible aneurysm.

As a means of favoring thrombosis by a local slowing of the circulation, carotid ligature has been extensively used. Lequist observes that while the general mortality of this measure is upward of 20 per cent, as applied to pulsating exophthalmos it is less than 2 per cent (113 cases), and Zeller regards it as almost free from danger. De Schweinitz and Holloway report for this operation, as applied to pulsating exophthalmos, 15 per cent mortality and 10 per cent disturbances of the central nervous system. Sweet's collection of twenty-five comparatively recent cases includes but a single death, and that an immediate operative one incident to the effort of an ingenious German to ligate the internal carotid, both within and without the skull.

Carotid ligation has been successful in about two-thirds of the reported cases.

A partial occlusion, particularly if it be a temporary one, is necessarily a safer measure in so far as brain function is concerned than one which completely and permanently closes the artery.

Sweet's research shows that arteries, obeying the law of muscular tubes, ultimately discharge into their lumina constricting silk threads. In tendon, catgut, or fascial strip from the patient there is provided material which will occlude long enough for a cure of the aneurysmal condition and which on absorption leaves a normally patent vessel.

As a means of starting a local thrombus, ligation of a dilated orbital vein is given first choice by de Schweinitz and Holloway, who have collected twelve successful cases, some of which exhibited alarming though transitory brain symptoms incident to the too wide extension of the thrombus. Later de Schweinitz somewhat modified his emphatic commendation of this method because of the notes of a fatal case which were sent him. Of five orbital cases collected by Sweet, two recovered, one was improved, and two were failures, one ending fatally.

As a general means of favoring coagulation repeated gelatin injections have been widely used. Sweet shows that three out of five cases were thus cured. Serum is generally regarded as safer and more efficient, and, subject to the test of clinical experience, should supplant gelatin.

The treatment indicated in these cases of pulsating exophthalmos, due to arteriovenous aneurysm, would be, after preliminary tests as to the effect of compression of the carotid: (1) An occlusion of the vessel by an absorbable ligature up to the point of stopping bruit and pulsation. The patient can best testify as to the disappearance of the bruit but must distinguish between a true ear tinnitus which

often follows basal fracture and the rhythmically throbbing noise of his aneurysm. (2) Ligation of one or more dilated orbital vessels. (3) Starvation diet, guarding against acidosis. Little fluid. Bowel evacuations, accomplished without straining, and two weeks rest in bed made, if not alluring, at least bearable by the judicious use of anodynes.

PERINEPHRITIC ABSCESSES[1]

By WILLIAM F. BRAASCH, M.D., Rochester, Minnesota
From the Mayo Clinic

WHILE the subject of perinephritic abscess has been well reviewed in various articles, its exact pathology is still undetermined and the question as to whether a perinephritic abscess may originate in the perirenal tissues without any primary involvement remains unanswered. Perinephritic abscesses have been referred to as primary or secondary: those originating in the perinephritic tissues being termed primary, while all others, whether originating in the kidney or some other focus, have been regarded as secondary. The existence of a primary perinephritic infection has never been definitely established either at operation or at autopsy. Because of the large amount of evidence which demonstrates that infection of the perirenal tissues is secondary to infection in surrounding foci, it would be more logical to regard all perinephritic infection as secondary or metastatic. A division may be made between an abscess of renal origin and one arising in other tissues. The former group should be termed true perinephritic abscess; the latter, subdiaphragmatic or retroperitoneal.

A review of the cases operated on in the Mayo Clinic for abscess in the perinephritic tissues lends support to such classification. One hundred and one patients had been operated on up to January 1, 1914, for abscess involving the perirenal area. In 34 of this number it was proved at operation that the abscesses were secondary to lesions in the extra-urinary tissues and because of their situation they were termed subdiaphragmatic or retroperitoneal abscesses. This group has been considered separately in a recent paper by Judd (1). There remain for consideration 67 with lesions which may be regarded as perinephritic abscess. Of this number, 46 were male and 21 female, or practically a ratio of 2 to 1. In 36 patients the abscess was found on the right side and in 33 on the left, or practically equal. On reviewing the cases the following direct etiologic factors were found in the order of their frequency:

1. Pyonephrosis.
2. Renal tuberculosis.
3. Nephrolithiasis.
4. Cortical abscess.
5. Traumatic rupture.

Pyonephrosis. Inflammatory or mechanical destruction of the renal tissue may exist for years without seriously incapacitating the patient except by occasional attacks of pain. A perinephritic abscess will not infrequently suddenly complicate the situation, and the patient is then forced to seek surgical relief. The abscess is usually drained at once, and the patient may go about for years with a discharging sinus unless the kidney is removed. Pyonephrosis was found as the source of perinephritic abscess in 12, or 19 per cent, of the 67 cases. Of this number, 3 were large infected hydronephroses of long standing. Immediate nephrectomy was done in 10 cases and drainage with subsequent nephrectomy was done in 2. The value of cystoscopic examination is rendered apparent in that the nature of the lesion and the functional destruction of the kidney was determined prior to operation. Drainage alone in these renal lesions is frequently attended with various complications, and subsequent nephrectomy may be rendered difficult.

[1] Read before the American Association of Genito-Urinary Surgeons, White Sulphur Springs, May 18–20, 1915; and the Southern California Medica Society July 18, 1915.

Renal tuberculosis. Renal tuberculosis as the apparent etiologic factor of perinephritic abscess was present in 10, or 15 per cent, of the cases. Evidence of perirenal infection with renal tuberculosis is often found at operation and, while it is more often characterized by the sclerotic type, the formation of abscess not infrequently occurs. Severe pain occurring with renal tuberculosis may be the result of mechanical obstruction in the ureter and is usually transitory in character. With perinephritic complications the pain more often remains continuous over a period of weeks. It is not usually so acute as with other types of perirenal abscess, nor are the other symptoms so marked, the temperature and the leucocyte count being considerably lower. The prognosis of perinephritic abscess accompanying renal tuberculosis is less favorable than with other forms of perirenal infection. Of the 10 cases operated upon 6 died within a few months after operation. In seeking the cause of the development of perinephritic abscess with renal tuberculosis it may be inferred that it is the result of secondary mixed infection. In 3 cases, however, no bacterial growth was reported on culture.

Nephrolithiasis. With stone in the kidney or ureter the pain is usually intermittent in character. When the pain persists over a period of several days or weeks, it is the result either of continuous urinary obstruction or of perinephritic abscess. The perinephritic abscess frequently brings the patient suffering from nephrolithiasis to a surgeon when the occasional colic will not. Nephrolithiasis was the direct cause of perinephritic abscess in 11, or 16.4 per cent, of our cases. In each there was a cortical abscess, the evident result of the stone, which in turn was the evident cause of the perinephritic infection. The appearance of the perinephritic abscess was usually marked by a continuous severe pain persisting for several days or weeks. In a number of cases, however, there had been no recent clinical data suggestive of any complication. The abscesses in these cases were small and had burrowed into the perirenal fat. Nephrectomy was performed in 6 cases, while nephrolithotomy and drainage of the perinephritic abscess effected a cure in the other 5 cases. It is an interesting fact that the cases in which the perinephritic abscess was directly connected with a cortical abscess healed merely by draining the perinephritic abscess. This apparently explains why drainage of the perinephritic abscess may suffice to cure the condition even though a cortical abscess be the underlying cause.

Cortical abscess. Direct evidence of acute localized renal infection, other than with pyonephrosis, lithiasis, or tuberculosis, as an etiologic factor in perinephritic abscess was found in 12, or 18 per cent, of the cases. Pus in varying amounts was found in the urine in all save 2. Eight of the patients were subjected to cystoscopic examination, and the urine catheterized from the affected kidney showed microscopic evidence of infection. Of considerable interest are the 2 cases in which repeated analysis of the urine failed to show any marked pathologic element save a trace of albumin and a few hyaline casts that were regarded as of no practical significance. At operation, perinephritic abscesses were found in direct communication with single small cortical abscesses. Recovery of the patients followed simple drainage. In 4 patients but a single cortical focus could be ascertained at operation; 3 of these recovered after drainage; the fourth suffered from a recurring abscess a month later. In 2 cases multiple cortical abscesses were found and nephrectomy was performed. The clinical symptoms in this group were characterized by their severity, evidence of marked infection being present in all. The leucocyte count was high and varied from 15,000 to 34,000.

In the discussion of this group of cases it is of interest that none of our series of perinephritic abscesses was found to have originated from a primary pyelitis or pyelonephritis. In the 211 cases of pyelonephritis and pyelitis which have come under our observation, there is no record of previous perinephritic abscesses. Chronic pyelonephritis or pyelitis is therefore an infrequent cause of acute perinephritic infection.

Traumatic perinephritis. Perinephritic abscess not infrequently occurs as a complica-

tion of traumatic rupture of the kidney, usually from one to three weeks following the injury. It occasionally follows severe injury to the loin even when there is no clinical evidence of renal rupture. Albarran's well-known experiment demonstrated that perinephritic abscess may be caused by trauma directed to the perirenal area. It might be inferred, however, that perinephritic abscess following such injury may result from a rupture of the kidney too slight to give clinical evidence. It is well known that the kidney may be ruptured with a slight injury only. It is not impossible that the source of many perinephritic abscesses following injury to an affected loin is a superficial rupture of the kidney with secondary infection. Perinephritic abscess complicating rupture of the kidney was found in 4, or 6 per cent, of our series. In 3 cases nephrectomy was necessary; in 1 case in which an abscess followed rupture of an upper pole, drainage alone was done, the patient making an uneventful recovery.

Perinephritic abscess without renal involvement. There remain 18 patients in whom no evidence of renal involvement was ascertained on clinical examinations. Two of this group had symptoms suggestive of possible spinal involvement and one later developed a typical psoas abscess. Another patient gave some evidence of possible pelvic source of infection, which leaves 14, or 21 per cent, of patients with no data as to the source of the infection. In many of this group the more recent methods of examination were not employed. Doubtless, with the aid of these methods, some evidence of renal involvement would have been found in a considerable percentage of these cases. There will be, however, a small group of cases in which no evidence of renal infection is found on clinical examination and the etiology of which may not be ascertained at operation because of the exigencies of the cases. This type of perinephritic abscess is usually more acute and in all probability forms a comparatively large proportion of the perinephritic abscesses seen in the emergency hospitals of large cities. It would seem logical to infer that a small solitary cortical or subcapsular abscess is the cause of these unidentified perinephritic abscesses. The frequency with which hæmatogenous infection subsequent to some superficial lesion occurs in cases of both renal and perirenal infection would suggest their close relationship. It is this small proportion of perinephritic abscesses which has been regarded as primary, because the evidence of renal involvement ascertained by means of the data available at operation was necessarily incomplete. It is in recent years only that the importance of several methods of clinical examination has been realized in the diagnosis of perinephritic abscess. With the aid of these methods, the renal origin of such abscesses will be found more frequently. The diagnosis of perinephritic abscess would be inexact without the data obtained through the following methods:

1. Repeated urinalysis.
2. Bacteriologic investigation of the urine catheterized from each kidney.
3. Estimation of the comparative renal function.
4. Radiologic examination, including that of the urinary tract, of the thorax, and pyelography.

Urinalysis. Israel (2) has called our attention to the value of repeated examinations of the urinary sediment in determining the renal origin of perinephritic abscess. He maintained that a few red blood-cells and pus-cells, together with albumin and occasional casts, may be found after repeated examination in practically every case of perinephritic abscess. On the other hand, it must be remembered that a few red blood-cells and pus-cells may be found in the urine as the result of a coincidental lesion existing in the lower urinary tract, which fact lessens its diagnostic value. The absence of red and white blood-cells in the urine would not necessarily exclude the possibility of renal origin. A practically negative urinalysis was reported in 10 of the 14 cases of unidentified perinephritic abscess. In a number of these, however, but one urinalysis was made. On the other hand, in the series of 34 subdiaphragmatic abscesses of definite extrarenal origin reported by Judd (1), red blood-cells or pus-cells were found in the urine in 3 cases, the origin of these cells

being in all probability in a coincidental chronic urethritis, trigonitis, or prostatitis which might be difficult to determine clinically.

Bacteriologic examination. Baum (3) reported 7 cases of perinephritic abscess, in all but one of which staphylococci were present in the urine. Although it has been demonstrated that bacteria, and particularly staphylococci, may pass through the kidney and be found in the urine without any renal lesion being present, the proportion of such cases is very small. Baum's report is one of exceptional interest and suggests a method which should be of considerable value in determining the renal origin of perinephritic abscess otherwise overlooked. The accuracy of this report is corroborated by numerous control tests, and by one case in particular, where the same organism was obtained from a cortical renal abscess as appeared in the perinephritic tissue. We have tried the method in 6 cases, in 4 of which staphylococci were found in the urine; in 2 cases the urine was negative on culture, and in one of these a retroperitoneal abscess extending from a perforated duodenal ulcer to the perirenal region was found at operation. In 2 cases a differential culture of the urine catheterized directly from the kidneys showed staphylococci from the affected side only.

Renal functional test. If a renal lesion is the cause of perinephritic abscess, a comparative diminution of functional activity from the affected kidney must follow. Although the cortical lesion may be slight, an appreciable difference should be noted between the functional output of the two kidneys. Using phenolsulphonephthalein, which lends itself admirably for this purpose, we have demonstrated a well-marked diminution of dye return from the affected side in 5 cases. (This number includes 3 cases reported in a previous article [4].) In one of these the microscopic examination of the urine was practically negative save for a trace of albumin. In a case of retroperitoneal abscess involving the perirenal area and secondary to duodenal ulcer, no difference in the functional activity of the two kidneys was found. In one case of chronic perinephritic abscess of probable renal origin the difference was too slight to be of practical value.

Radiographic evidence. Röntgen examination of the urinary tract must necessarily be a preliminary step in every case of perinephritic abscess. It must be emphasized that a well-marked etiologic lithiasis may be present without causing preliminary subjective symptoms. Röntgen examination of the lower thorax, made in order to observe any abnormal change in the position of the diaphragm, may be of considerable practical value in differential diagnosis. This is particularly true on the left side where both a perinephritic and a subdiaphragmatic abscess may be the cause of considerable displacement.

Pyelogram. Renal infection past or present usually leaves some evidence of its presence in the outline of the pelvis or ureter which can be rendered visible by means of the pyelogram. Very recent infection may not, however, cause sufficient change in the pelvic outline to be of diagnostic value. The pyelogram was of considerable value in 2 of our cases where the clinical data suggestive of renal involvement were indefinite.

Differential diagnosis. It may be difficult on clinical examination to differentiate perinephritic abscess from acute septic nephritis. In the early stages of abscess development the symptoms of the two conditions may be quite similar; both may be characterized by high temperature, leucocytosis, severe pain, and tenderness referred to the affected kidney area. However, with the increase in size of the perinephritic abscess, palpation will usually determine the condition. Although the existence of an acute perinephritic abscess may easily be determined, chronic perinephritic abscess may remain unrecognized until revealed at operation.

It may be difficult to differentiate between a subdiaphragmatic or retroperitoneal abscess and true perinephritic abscess. As a rule, symptoms of the original lesion and a more general invasion of the tissues will differentiate the two conditions. The data obtained through urinalysis, cystoscopic examination, bacteriologic examination, renal functional tests, and the röntgenogram are often of considerable aid in differentiation.

Results. Of the 67 patients operated on at the Mayo Clinic, only 2 (3 per cent) died as the result of the operation. Three other patients were reported dead at three, seven, and twelve months, respectively, after operation.

The subsequent course was ascertained in 51 of the remaining patients. In 18 of this number the wound had healed in less than a month after operation. Of the remaining patients, 16 continued to drain for two months, 6 drained for three months, and 3 drained as long as six months after operation. The fistula persists to the present date in 4 patients, all of whom drained longer than six months. In 2 of these patients an etiologic renal lesion was ascertained at the time of drainage and subsequently nephrectomy was advised. In the other 2 no evidence of renal lesion was discovered on clinical examination; however, the more recent clinical tests were not employed. One of these patients, drained one and one-half years ago, has returned with cystoscopic evidence of an etiologic renal lesion not previously discovered.

The question is frequently raised at operation whether immediate nephrectomy or drainage of the abscess alone is indicated. In the presence of a large fluctuating abscess and marked physical weakness drainage will suffice; if, however, evidence of considerable renal involvement has been ascertained, immediate nephrectomy as well as drainage is to be preferred when possible. The practical importance of previously ascertaining the underlying renal condition is self-evident.

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OBSTETRICS, A LOST ART

A Criticism of the Promiscuous Indications for Cæsarean Section[1]

By RUDOLPH WIESER HOLMES, M.D., F.A.C.S., Chicago

THE basis of this paper is not so much the impression derived from a perusal of the literature as it is the opinion substantiated by personal discussion with obstetricians whose judgment is worthy of the most serious consideration. Repeatedly it has been stated in these private discussions that the indications for cæsarean section have been inordinately broadened until very largely they have assumed a dangerous, if not a ridiculous, aspect. The teaching and the practice therefrom at the hands of the unthinking, is a pernicious one, and should be curtailed. The fundamental principles embodied in this paper belong to the writer, yet to a great extent they likewise belong to others. The fact that the opinions are not strictly personal leads him to believe that the discussion is pertinent at this time.

There may be no question that the attendance upon the woman in labor antedates all other medical and surgical activities; during the period when medicine was developing into a system of empiricism, surgery had little to commend for itself, and during this same period obstetric knowledge was enormously advanced by those pioneers who found operative work upon the parturient women an inviting field. During the closing period of the seventeenth century, on through the eighteenth and into the nineteenth hundred years, manual dexterity was developed to a degree which is too little appreciated in these times. We see the discovery of version by Ambrose Paré developed to a high degree by his school; we see the facility of breech extraction enhanced by the recommendations of Maureceau, Deventer, Smellie, Wiegand, and others; then forceps came into being by the ingenuity of the Chamberlain family, perfected in many essentials by Smellie, Levret, Hubert, Simpson, and Tarnier, which discovery largely superceded in practice the teaching of the versionist school; still later we see correctional procedures developed to a really high art by the contributions of Baudelocque, Schatz, Thorn, and Ziegenspeck; in this connection, too, we see Braxton Hicks mature a maneuver by which the child may be turned by digital means; then, again, we see the development of our knowledge in the production of dilatation by the manual methods of Harris and Edgar, by the instrumental method, of which the Bossi appliance is the prototype; in this same period Dührssen revived cervical incisions, which were so ably practiced by Blundell a half century before; and, finally, Dührssen and Aconci presented us vaginal cæsarean section as a climax. Then the combination of the discoveries of general anæsthesia and asepsis have placed it within our power to cover the operative field of obstetrics painlessly and safely for the mother, and thereby with enhanced safety for the child. These two boons, which aptly have been denominated two of the "modern seven wonders of the world," carry their curse in permitting an unreasonable widening of the scope of this operation, cæsarean section. Within the past thirty years the general rules of conduct have been so clarified that we may truly state that no department of medical knowledge has been so definitely and positively placed in the domain of an exact science and art as has been the case with obstetrics. As the writer reads the voluminous case reports and essays on cæsarean section in our current literature, and has narrated to him the case reports, which never will be published, as they were not justified by scientific teaching, he wonders whither we are drifting. Are we attempting to minimize the precepts and examples of the past masters in the art, or are we attempting to ride, rough shod, past all obstetric rules in the hope of formulating the axiom that the quickest way out is the ethical way? He believes that within a brief period there will be a revulsion of feeling, and the surgical propensities of the present

[1] Read before the Chicago Gynecological Society, June, 1915. (See discussion, p. 663.)

will be enormously curtailed. In this place it can but be well to quote one who has done much to popularize cæsarean section as a sort of makeshift for real obstetric practice:

"With the operation thus shorn of its terrors, it is no wonder that it is being more and more resorted to, where, for one reason or another, the passage of the child through the birth canal is attended with difficulties. But this very ease of performance with its accompanying good results, like almost every abdominal operation, has led to the abuse of the operation, not merely in the number of unnecessary operations performed, but in the kind of cases subjected to cæsarean section. . . . And out of this discussion will finally come the knowledge of the true place of the operation in obstetric surgery." Today the medical profession is seized with the same *furor operativus* for cæsarean section as obtained a quarter of a century ago in the case of oöphorectomy.

The writer holds that there is essentially one, and only one, scientific indication for cæsarean section, and that is where there is such pelvic contraction that it is quite impossible to secure a living child by any other means; here all obstetricians are unanimous in their teaching and practice. It is consistent practice to hold that as the risks of craniotomy or pelvic separation, or even high forceps, are so great when the pelvis is markedly diminished in size — that is, down to six and a half centimeters — that it is wise to extend the absolute indication for a cæsarean section to seven, or even seven and a half centimeters. And yet, in the old days, when craniotomy was more prevalent than now, he has wondered, after the stress of a difficult and dangerous operation, if it were not well to advance even our limit for the absolute indication to a higher point — even to eight or eight and a half centimeters, *when the baby is alive, and the mother in good condition, and free from a potential risk of infection.* We know a pelvic contraction of this degree persists inevitably during the woman's life; we have a reasonable, practically a definite, certitude that no child the given woman will bear will be other than disproportionately large; therefore, the same difficulties will be present in each labor. However, it must be constantly borne in mind that some women habitually bear small children, and though the pelvic contraction be material, there is no disproportion to be considered. In this connection, there is a vivid picture of the woman upon whom the writer did a prophylactic version, and breech extraction twice, and a colleague likewise delivered her by the same procedure in a third labor, and all the babies did well.

On the other hand, when the pelvis has a contraction whose index is above seven and a half centimeters a domain is entered which is fraught with many problems. There are so many factors concerned that the writer holds that it is questionable practice for any, unless he has a close and intimate knowledge of pelvic mensuration and fœtal palpation, and has an accurate knowledge of the parturient woman in normal and pathologic labor, to attempt to lay down indications for cæsarean section. A surgeon, gynecologist, or general practitioner who has not had that experience and practice from a continued obstetric clientele has not the matured judgment or qualification for the interpretation of conditions and indications for a cæsarean section, not alone in this connection, but in the placing of the indication for the operation in any of the specious reasons for a section. The mere fact that a woman has a minor pelvic contraction is no warranty for a section. The evidence of a disproportion must be weighed, the character of the uterine activity must be estimated, the status of the soft parts must be considered, and, too, her surgical risks must be properly balanced. It is a common experience of all trained obstetricians that many a time, the pelvis having a minor contraction, labor pains will be ineffectual during the first stage, due to the fact that the presenting part is prevented from pressing upon the lower uterine segment sufficiently to arouse the characteristic phenomena of labor. The head will float above the brim, suggesting a true cephalopelvic disproportion, and the unwary will deem this as amply justifiable for a section, while the initiated will know that watchful expectancy will be followed by active con-

tractions. *After the membranes have ruptured*, engagement will take place with proper molding, and eventually a spontaneous birth will take place, or, perforce, a simple forcep extraction. It is impossible to quote offhand as to the frequency of such an occurrence in private and hospital practice where it is the writer's rule that all women who have a contraction to nine centimeters, or *below*, are permitted to enter labor. The course of labor is controlled by abdominal palpation and rectal examination. By this method, even where Müller's and Kerr's maneuvers suggest a real disproportion, it is surprising how readily the head eventually will descend. If there be no descent, the writer holds that it produces no jeopardy to the woman or child if we await even the rupture of the membranes for then only will the lower segment guide the head into the brim. *It is not so much the fact of the rupture of the membranes which determine an infection after the cæsarean section as it is due to vaginal examinations, which mean the introduction of the finger within the* lower segment and over the exposed crown of the head. It should be held as an aphorism that vaginal examinations always are a potential source of infection in labor, and particularly when a section is under advisement.

It is a digression, but it is deplorable that physicians in obstetric work have not schooled themselves to make their necessary vaginal examinations in pregnancy, and then to limit further pelvic investigation by rectal exploration in labor. Following this custom it is surprising how well conditions may be properly interpreted by rectal means. To be sure, certain factors will be impossible of discovery unless vaginal examinations are made. Fortunately, generally these doubtful points are inconsequential in most cases where the possibility of a section is under advisement. Further, it is essential that a careful study of the contractions should be made, their effect on mother and child should be noted, the maternal pulse should be watched, and the fœtal heart rate determined by repeated examination. It is self-evident that the first signs of cardiac acceleration is indicative of maternal exhaustion; any elevation of temperature is strongly suggestive of an antepartum infection. A section performed with these signs present, promises a high maternal death rate. It would be infinitely preferable to remove the child through the parturient canal, by such operation as expediency will suggest, than subject the woman to a great danger of death by an ill-advised section.

Again, it is a great error to run precipitately to a section because there is a seeming cephalopelvic disproportion. It is known that minor cephalic displacement, or mal-position, will retard descent of the head. An occiput directed to the rear, the R. O. P., for example, characteristically has the head floating until labor is well advanced. What a parody on good obstetrics it is to do a cæsarean section; but it has been done repeatedly, when a manual rotation and fixation of the head would answer every purpose. Some of you may recall that one of our eminent gynecologists, called in consultation on a breech case in a multiparous woman who always had had easy labors, performed a cæsarean, as the breech had not yet entered the brim, not knowing that such was a characteristic phenomenon of the normal breech.

In recent years a cursory reading of current literature will demonstrate the frequency that cæsareans have been done for face, brow, occiput posterior, transverse presentations, that rightly should have been treated by obstetric art. How frequently we read case reports where no mention is made of the pelvic contraction, or, if mentioned, the degree of pelvic contraction is omitted, where, perhaps, stress is laid on the fact that the external measurements were diminished, but no mention made of the pelvic capacity, when all obstetricians of experience know that external pelvimetry is essentially worthless for the determination of actual internal pelvic deformity. Certainly there is a crying need for a more widespread experience in internal mensuration. In the absence of this knowledge, how is it possible to interpret the indications for operation? It would be infinitely preferable, if we have a difficulty in labor, to test the primiparous woman, and if peradventure the child should be lost, then

if necessary perform the section in the subsequent labors. But it must not be forgotten that a first labor may be ever so difficult and the later labors of surprising ease. This is as true of women with minor pelvic contraction as it is of the truly normal. To have performed a section in the first labor, and doom the woman to cæsareans forever after, is small warrant, when perhaps the trouble was really due to tense soft parts, or a minor deviation of presentation.

TUMORS OBSTRUCTING THE BIRTH CANAL

These matters are so broad that it would be quite impossible to cover them adequately within the limits of this paper. They are mentioned merely to state that many times watchful expectancy may bring the most happy results. To make a practice of cæsarean section in each instance is to be ruthless in operating. If the woman is seen in pregnancy with an ovarian tumor it may be best handled by timely removal, and gestation be allowed to go to term; if miscarriage should take place it is a lesser calamity than to allow her to go to term, do a cæsarean section, and compel her to submit to a like procedure in each subsequent labor on account of the vulnerability of the uterine scar. Oftentimes, when the ovarian tumor is first discovered in labor, the conservative and proper course, when the tumor does not interfere with the descent of the head, is to deliver from below, and later remove the tumor by laparotomy when conditions are more favorable. Per contra, when the tumor does obstruct labor, then the judicious procedure is to do the cæsarean section, followed by the ablation of the cyst.

A fibroid, which generally means hysterectomy when treated surgically, should not be removed in pregnancy unless distressing or dangerous symptoms develop. The danger signs are necrosis, hæmorrhage, infection, or pressure. If the fibroid, at term, does not obstruct the birth canal the wise conservatism is to deliver from below, and later treat the woman as expediency demands. It must not be forgotten that often uterine tumors are true myomata which hypertrophy with the advance of pregnancy, and involute *pari passu* with the uterine retrogression, to a complete disappearance. To perform a cæsarean, when the tumor does not obstruct labor, then do hysterectomy, for this type of tumor is to rob the woman of future childbearing, and is not judicious surgery. The *fibroid or ovarian cyst which blocks the birth canal is as truly within the domain of an absolute indication for cæsarean section as is a like degree of pelvic contraction; but in the case of the cyst, its removal obliterates the indication in subsequent labors, yet the necessity, due to the uterine scar, demands the same procedure in each labor.*

ECLAMPSIA AND CÆSAREAN SECTION

In recent times much has been written of the *treatment* of eclampsia by cæsarean section. The writer believes this is an egregious misnomer. A surgical operation is not the treatment of eclampsia. No one may gainsay that much is gained in the treatment of an eclamptic by the opportune early delivery; but the manner of consummating that delivery is not the treatment, it is the fact that the ovum is eliminated from the uterus. In all the discussions of this aspect of the question, much is stated about the technique of the operation, the number of the convulsions, and general discussion of statistics, but the essential treatment, as we see it today, is utterly ignored. All the polemics on the possible methods of delivery leave out *in toto* the question as to what anæsthesia was used, what measures were instituted before and after operation to secure elimination from the bowels, skin, and kidney; if venesection were employed, if sedatives were exhibited alone or in combination with veratrine viride. Without these complex problems, an argument as to whether this or that procedure was employed for delivery is really specious. Further, who has thought that perhaps a series of thirty cases without a death may not have been due to variations in climatic conditions, as Stroganoff maintains, or seasonal change in diet—or what not! How else do we explain Stroganoff's 113 cases with a maternal mortality of 5.31 per cent against the usual figures of 20 or 25 per cent? We can but take Reuben Peterson's figures to

show the futility of making favorable deductions from the use of cæsarean section; in his paper on "Vaginal Cæsarean Section for Eclampsia," of 530 cases, 124 died, a mortality of 23.4 per cent: in his paper on "Abdominal Cæsarean Section in Eclampsia," of 500 cases, 174 died, a mortality of 34.8 per cent. Can it be debated that the substances which produce the convulsions of pregnancy is other than a systemic paralyzant? Is this not shown by the dry harsh skin with the difficulty of securing diaphoresis, the impossibility, at times, of securing alvine discharges, the suppression of urine, and the blunted if not completely obliterated sensorium? We know that women do not withstand the shock of an abdominal operation as well as when a parallel procedure is done by the vaginal route; we know that abdominal operations do produce now and then a paralysis of the splanchna, as evidenced by the bowel stasis or adynamic ileus, and the suppression of urine. To crowd an abdominal operation upon a woman already with abdominal shock, or better, perhaps, saturated with a paralyzant poison, appears not to be either good surgery or obstetrics.

Unquestionably this explains as much as anything the reason why there is a 11.4 per cent greater mortality by the abdominal route than by the vaginal. Why not return to the simple procedure of Philander A. Harris which so fully meets all the needs in the vast majority of cases? Is it because so few obstetricians know the real method of Harris' digital dilatation? In a great measure this must be true, for the illustrations and descriptions in the textbooks are wrong — even the illustrations in Dr. Harris' own paper are not true, as he himself told me sometime before he died.

We could not question the expediency, yea necessity, for the performance of cæsarean section under certain conditions in the eclamptic woman. When it is done, it should be fully recognized that it is not the eclampsia but the contributory factors which force the operation upon us. The combination of a minor pelvic contraction with eclampsia, the presence of rigid soft parts, placenta prævia, or pelvic tumors, properly would sway the mind in this direction; for each of these enormously influences the quickness with which a delivery may be consummated.

PLACENTA PRÆVIA AND CÆSAREAN SECTION

You may recall that two of the first practitioners who employed cæsarean section for placenta prævia had their own views as to when one of two methods was to be used. One stated in 1882: "I would recommend cæsarean section, if a man had performed or assisted at 200 abdominal operations and the mortality was below 7.5 per cent, as a substitute to Hick's version, or the alternative measure—if a surgeon is not at hand—do version." The other states: "For the successful performance of version an obstetrician having the necessary experience (performance of 50 versions, for instance, being considered sufficient experience) is not so readily obtainable." Then we have the well-known surgeon who candidly admits he did the abdominal operation for placenta prævia as he knew its technique and did not know how to do a version. In my previous contribution on cæsarean section for placenta prævia we showed that the maternal and fœtal mortalities for this method of treatment was 20 and 36 per cent respectively; the obstetric treatment gave a majority of 7 and 55 per cent respectively. As previously shown, cæsarean section saved one baby for each woman who was killed by the procedure. There may be no question that the abdominal operation is a ready means of evading certain complications of placenta prævia, and at times should be the only resort considered; but the writer is convinced that the practice of some operators of making it the only means of delivery are assuming a burden of which they in later maturity of judgment will regret. At the present time, their teaching is a pernicious one. As a working hypothesis, one or more of the following conditions should obtain for the proper performance of cæsarean section for placenta prævia:

1. *A contracted pelvis.* In an absolutely contracted pelvis the prævia is merely an unfortunate complication. In a relatively con-

tracted pelvis, the possibility of watchful expectancy is not to be countenanced—delay may mean the death of the two patients. On account of the difficulty of operating through a diminished birth canal the bag therapy or Hicks' version are fraught with such difficulties that cæsarean section probably, definitely, would be the operation of election.

2. *Cervical rigidity.* This is largely a specious argument for, as shown in our previous communication, it is one of the rarest complications of placenta prævia; hardly one case in a thousand is likely to have it.

3. The pregnancy should be near term, and the child in good condition. Subordinate to this, there should be such a status of affairs as to make a section advisable, though not technically a correct indication; a woman may have been sterile many years, late in life, perhaps at the climacteric, she may conceive, go to near term, and have a complete prævia. In such an instance a section would be expedient. However, this reason is so elastic that it easily may be used to sway the operator one way, as an argument for the "therapeutic abortion" may pull another man toward doing the woman's behest.

4. The fact of a *marked* prævia should be determined, the necessity or advisibility for the section be fixed, then an interval of some days should elapse whereby the risks of a potential infection introduced by the examining finger may be eliminated. During this interval the woman should be in a hospital. It is dangerous to examine repeatedly, perhaps attempt dilatation, then resort to the section.

5. There should not be a retraction of the lower uterine segment, for the paralysis of the lower segment may determine a postpartum hæmorrhage, produced by a true paralysis of the placental site.

INDEFENSIBLE INDICATIONS

Many a cæsarean section has been done for indications which have been exceedingly specious, indications which are far fetched. These cæsareans never will be reported, for there was no real justification for their performance. Many of these operations are exemplifications either of the lack of judgment in placing indications, or of ignorance of true obstetric facts. Many a time, as rumors are bandied about of a cæsarean section being done for strange reasons we could not question the surgical ability of the operator, but we must concede their lack of obstetric equipment. It is not right for the surgeon, gynecologist, or others, to lay down the indications for a grave obstetric procedure when he, perhaps, never had had an obstetric experience, or his limited experience may have been obtained many years before. It is a pernicious system and looks not for the best interests of the patient. At least he should defer to the judgment of the obstetrician, to the man who has an abiding interest and contact with the specialty. And yet it is not alone the man whose training fits him for other fields of medicine who is forgetting the obstetric principles, but too often the obstetricians themselves have wildly seized upon cæsarean sections as a ready and quick means of getting through with a case. How easy it is to spend some thirty minutes in performing a cæsarean, and how hard it is to perform a Hicks' version or perhaps introduce the bag, and then to await the time for the work to be completed, sitting up half the night perhaps. How loath the gynecologist is to give up to his assistant even a minor thing like the simple perineorrhaphy, and yet too often the complicated obstetric case is left to the tyro of the clinic because it is "coming off" in the small hours of night.

Let us just present a few of the indications which have been gathered in the course of informal obstetric talks. Perhaps you may say they are mere rumors, but each one was narrated by the one who knew the facts, or they have been culled from the literature. Within the last few days, a physician, in all seriousness, stated he was about to do a cæsarean (and he did it a day or two later) on a woman, seven months pregnant, with a pyelitis, his defense being that the vulva was contaminated by the colon bacilli which were the etiologic factors of the kidney disease, she having a badly torn perineum. The baby died promptly. Not so long ago

a surgeon did a section on a woman who had been in labor from Monday to Friday evening. As the head was deeply in the pelvis he perforce did a symphysiotomy to withdraw it. The most miraculous thing of all, the mother and baby survived! Recently we saw in the literature the report of two cæsareans for primary inertia. Whither are we drifting when face, brow, occiput posterior, transverse presentations, prolapsed cords are treated by cæsarean section? Only the other day, a physician asked why a cæsarean was not done on a primipara, with kidney of pregnancy, in the eighth month instead of introducing the Voorhees bag—and this in a woman with a normal pelvis and soft parts. What can you expect of medical students when they see more cæsarean sections than they do of any of the ordinary obstetric procedures? Can it be wondered at that they lose the perspective and even recommend that *cæsarean section be done for post-partum hæmorrhage?* What can we expect when right and left cæsareans are being done after repeated questionable examinations have been made, and where attempts at delivery are made which maim if they do not kill the child?

It may come about occasionally that there may be such a combination of circumstances, or of complications, which, each alone, would offer no justification for a section, yet the complexus of conditions may make a section the lesser of evils; but such should be preceded by adequate consultation.

In conclusion it should be recognized as a cardinal principle that a contracted pelvis alone is the real indication for a cæsarean section, for pelvic deformity alone is definitely certain to obtain throughout the woman's life; the indication which prompted the first section will demand it in each subsequent labor. The treatment of a fibroid certainly will determine her sterility, so the woman is no longer considered in an obstetric relation. On the other hand, in the case of eclampsia, placenta prævia, ovarian tumors, and the many other complications which necessarily or unnecessarily may have been managed by cæsarean section leaves the woman in a precarious state if another pregnancy should occur. No one knows the frequency of rupture of a cæsarean scar, for too often the accident happens, not in the practice of him who made the operation, but in the hands of unskilled aid, so is not recorded. We know that A. Davis had three ruptures in 180 sections, so at least one section in 60 is to be be followed by rupture in a later labor. This danger is a real one, and must be clearly appreciated by him who contemplates a section on debatable grounds. Those who now are advocating cæsarean sections for placenta prævia, eclampsia, etc., must bear the culpability for the deaths which may result from the uterine rupture at a later time. In estimating mortality percentages, such deaths must be credited to the primary operation, not placed in a class by themselves. It has been claimed by many if they themselves or other skilled operators do the suturing that no loss of continuity can occur. This is absurd, for none, however skilled or careful he may be, can vouch for the absolute durability of his catgut, can estimate the phagocytotic influence of the uterine wall. Can anyone imagine a more unhappy plight of a primiparous woman who has been treated by a cæsarean section for eclampsia or placenta prævia, with a perfectly normal pelvis, who is, and should be, perforce, doomed in all her subsequent confinements to the same abdominal surgery?

It should be an obstetric aphorism that a *cæsarean section once is a cæsarean section always.* It is but necessary to mention that Franz, Jardine, Cameron, and others have expressed this dictum. The only exception should be in a multipara who has born a child through the parturient canal, with normal pelvis and relaxed soft parts, and her labor should be controlled in a hospital.

CONCLUSIONS

1. A contracted pelvis alone should be considered as the single, definitely permanent indication for cæsarean.

2. No cæsarean should be considered, unless the baby is in good condition, unless it is the only resort.

3. *Per se*, eclampsia, placenta prævia, or other specious indications do not offer war-

ranty for the operation unless there be some contributing obstetric anomaly.

4. All women with a relative indication (pelvic contraction) should be allowed to go into labor so she may have a real *test of actual cephalopelvic disproportion*. During this test no vaginal examinations should be countenanced, but labor should be controlled by abdominal palpation and rectal examination.

5. It is neither wise nor expedient to permit a patient with an absolute indication or where it is a repeated section, to enter labor.

6. A cæsarean scar is a vulnerable point in the uterine wall, and is likely to rupture; therefore, a cæsarean section once is a cæsarean section always. The only exception worthy of consideration would be a multipara with soft, lax, or torn pelvic floor.

7. Cæsarean sections have been performed on inordinately broadened indications which in many respects are not defensible. The indications should be restricted.

8. Obstetric manual dexterity has been compromised by the development of cæsarean section. The beneficient results from obstetric procedures should be emphasized.

9. One who has a mortality of 5 or more per cent for his cæsarean sections should revise his indications—should use discrimination in his selection of cases.

CHANCRE OF THE CERVIX UTERI

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FOR obvious anatomical reasons the primary syphilitic sore in women is very apt to remain a hidden and unrecognized lesion. By far a smaller number of chancres occur on the major and minor labia in women than upon the external genitalia in men. The majority of initial lesions as they are found in women occur on the external genitalia, or just within the vestibule. The vaginal wall itself is extremely rarely the initial site of the infection.

For various reasons one would suppose that chancres of the cervix uteri would be quite common; the infection being usually situated at or near the distal portion of the male organ, one would naturally assume that infection of the cervix during coitus would be a not infrequent occurrence. This supposition, however, is not borne out by actual facts, since cervical chancres are really rare, at least so one must judge by the very scant literature covering this subject.

The texts on gynecology throw very little light on cervical syphilitic ulcers, and the question of differential diagnosis between this condition and other cervical pathological entities is not mentioned.

Fournier reports 13 of 249 cases in which the cervix was found to be the site of the primary lesion, a percentage of five. Rosemuff during six years of experience found only one per cent of his cases in which the cervix was the site.

During the past eight years one of us has seen no less than six definite cervical chancres, and during the past two years we have been able to study two examples of this condition at the University Hospital. Neither of these cases resembled the other in the slightest degree. The extremely interesting clinical findings and the paucity of the literature on this subject seemed to us adequate reasons for publishing our observations, the case histories of which are as follows:

Case 1. The patient, 37 years of age, was admitted to the University Hospital, complaining of vaginal discharge. The family history was negative. Patient was the mother of four children, ranging in age from eleven to eighteen years and said to be well. She had had three miscarriages, the first coming after the first child, at the seventh month

of pregnancy, and each of the other two occurring during the third month of pregnancy. The patient was unable to offer any reason for any of the miscarriages. Six years previous to her admission she contracted gonorrhœa from her husband, who admitted extramarital exposure. In 1910, or two years later, she again contracted a disease which she says resulted in a chronic discharge; in 1912 she separated from her husband and since that time has been extramaritally exposed to infection on several occasions.

Present history: One month previous to entry, following extramarital exposure, the patient noted that after her regular menstrual period there was a marked increase in the chronic vaginal discharge from which she had been suffering for so long. This discharge is described as a foul-smelling watery fluid, often becoming sanguineous at night. The patient herself felt that the cervix was enlarged, although it was not tender on palpation. The swelling, however, became so marked that she suffered considerable pain when in the sitting posture, and it was this symptom which led her to consult a physician. The discharge increased in amount, and became yellowish in color. During the past few weeks there has been some loss in weight together with a considerable and increasing weakness. The hair has been falling out rather rapidly, and the throat became sore and the voice hoarse. Within a few days previous to her admission the patient had noted small lumps behind her ears and an eruption over her body.

Examination of the patient revealed the following findings: A maculopapular, typical secondary syphiloderm over the trunk and upper extremities. Mucous membranes of the mouth and of the pharnyx clean. Vaginal examination revealed a markedly œdematous cervix, the left side being especially enlarged. To the palpating finger the cervix felt considerably more indurated on the left side. Over the œdematous portion, as well as over the upper right side of the cervix, there was an extensive superficial erosion. The eroded surface was decidedly hæmorrhagic in character. The remainder of the mucous membrane covering the os was intact, and except for a purplish color quite normal. The axillary and submammary lymph-glands were only slightly palpable; those of the cervical and inguinal region were markedly enlarged. The spleen was not palpable. Examination of the blood and urine revealed nothing unusual.

Case 2. The patient, a girl of 18 years, entered the hospital with a complaint of severe noctural headaches for the two weeks prior to entry. She had no knowledge of syphilis, but came to the hospital because she thought that her paramour had the disease. In her family history there was nothing of importance; the present history likewise was negative.

On examination, the patient was seen to be a well-nourished young woman. The pupils were equal, and reacted to light and accommodation. The skin of the entire body was clean. The mucous membranes of the mouth and pharynx were normal. The external genitalia were normal. About the anus were numerous macules suggesting the beginning of large moist papules, although there was no infiltration of these lesions. On vaginal examination, the left side of the lower lip of the cervix was found to be the site of a small dark-red erosion about one centimeter in its widest diameter. This erosion was sharply demarcated from the remaining portion of the os uteri; there was a very slight discharge of a thin serous material. Examination of the glandular system showed a marked general adenopathy. The Wassermann reaction was positive.

Following treatment and after the second injection of salvarsan the lesion was practically involuted, only a slight bulging and reddening of the posterior lip remaining.

In both of these cases living spirochætæ were demonstrated with a dark field, in smears from the suspected lesion.

The standard texts on gynecology state almost without exception that chancre of the os uteri is a very rare condition. There occur especially frequently in women many cases of frank secondary syphilis in which neither the usual examination nor the anamnesis reveal the presence of the primary sore. In many such cases the chancre, perhaps of the external genitalia, has undergone involution before the patient is examined. It cannot be disputed, moreover, that the discovery of the chancre in women is frequently overlooked, and it may be safely assumed that this apparent rarity is largely due to the failure of complete examination, and to inability to recognize the condition when present.

As has been mentioned before, the statistics of various authors who have written on this subject, while showing considerable variation, nevertheless all support the idea that chancre of the os uteri occurs with relative frequency. Fournier found the primary sore in this location in five per cent of his cases in which a chancre could be demonstrated. Our own experience in a series of fifty cases of fresh syphilis in women gives a proportion of four per cent.

In general the chancre of the cervix differs from that in other parts of the body only in so far as it is modified by anatomical or physiological characteristics of the cervix. As in other chancres, it is indurated, painless,

usually single, being an eroded papule or nodule, and accompanied by a satellite bubo. These characteristics, however, are not as easy to determine as they are in a primary sore of the external genitalia. The difficulty of recognition is all the more apparent when one considers how often the chancre may be atypical. With regard to the induration, which is so essential a feature in the diagnosis of the chancre, difficulty is at once apparent when one considers that the cervix is normally firm, and to the palpating finger somewhat indurated. In the majority of cases, moreover, one is unable to introduce the hand far enough into the vagina to palpate satisfactorily a suspicious lesion on the cervix.

The œdema and general hypertrophy which so frequently accompany the cervical chancre make the demonstration of induration the more difficult, as does also increase in size due to metritis.

The satellite bubo, so valuable an aid to the diagnosis of chancre elsewhere, is seldom demonstrable in cases of cervical chancre. The cervix is drained by the perimetrial, hypogastric, and iliac glands; and it is probable that an adenopathy occurs in these chains, but this is not clinically demonstrable. The occasional swelling of the inguinal glands in cervical chancre is explainable probably on the anastomosis between the lymphatics draining the glands of the uterus and vagina.

In the majority of cases no functional disturbance results from the presence of chancre of the cervix; the lesion is entirely painless, both spontaneously and to the touch, and the patient usually has no hint of its existence. That this latter is not always true, however, is borne out by our first case in which swelling of the cervix was so marked that the patient was able herself to state where her trouble lay.

It is well known that the chancre wherever seen is subject to great variation in its morphology. The cervix presents no exception to this rule. The chancre may present itself as a simple erosion on the one hand, or as a hypertrophic fungating vegetation on the other, and there may be types varying between these two. In the cases described above, one chancre presented itself as a simple erosion, the other as a fungating lesion so closely simulating cervical carcinoma that this diagnosis was suggested by a number of colleagues who saw the case with us.

Analyzing the cases in the literature, it would seem that the chancre commonly occurs as a flat, purplish erosion, somewhat sharply raised above the surrounding tissue, not infrequently covered by a pseudomembraneous exudate. The lower lip is more commonly involved than the upper, and as in chancre of the rectum the lesion may be linear, and extend up into the cervical canal. The purpuric or hæmorrhagic border so characteristic of the chancre is usually demonstrable in cervical lesions. The essential papular nature of the chancre elsewhere, however, is not apparent on the cervix. The demarcation from the surrounding tissue, however, may not be a sharp one, the borders either fading gradually into it or being on the same level. Rapid development, together with spontaneous involution, may be said to be rather more striking in cervical chancre than in initial sclerosis elsewhere. Occasionally a very superficial red erosion may persist for some time in untreated cases. The discharge from the lesion seems to be dependent upon their size, the simple erosions being attended by slight discharge, the larger hypertrophic types being often attended by considerable seropurulent exudate.

The differential diagnosis includes the consideration of the following conditions: simple cervical erosions, chancroid, Herpes simplex, and carcinoma.

Depending upon the type of the primary lesion present, simple erosion and carcinoma are the most difficult to differentiate. The ordinary clinical differences between Herpes and chancroid on the one hand, and chancre on the other, apply with the same exactness and directness to chancres when they occur on the cervix, as when they occur elsewhere, and no great difficulty is encountered in differentiating these two conditions.

The definite clinical picture of cervical erosion with its catarrhal discharge, the associated swelling, reddening of the cervix, and severe uterine pain constitute valuable differential points between simple erosions and chancrous lesions.

The objective picture of the lesion itself in simple erosion presents many points of difference from that of the chancre; thus the erosion is usually granular, showing a very irregular ulceration and is very apt to be follicular; and, lastly, of great importance is the chronicity of the erosion, as against the relatively acute course of the chancre.

From carcinoma, the differential diagnosis of the hypertrophic form of the chancre is apt to be more confusing. In the second case described by us the presence of hæmorrhage, the marked friability, and the vegetative character of the lesion led our gynecologic colleagues to advance the diagnosis of early cervical cancer. Indeed, the diagnosis is extremely difficult in such cases. The spontaneous healing of the chancre, with its rapid onset, and the microscopical examination, may be the only points of clear differentiation. To this we should like to add the differential point which assisted us in our case: namely, the demonstration in the lesion of living spirochætæ. In conclusion, we believe that more frequent examination of women in the early secondary period of syphilis, in whom the chancre is not present on the external genitalia, would reveal a far greater number of cervical lesions than the scanty literature would seem to indicate. Admitting the condition to be uncommon, we feel that it is often missed by not being sought.

PHYSIOLOGICALLY ACTIVE SUBSTANCES CONTAINED IN THE PLACENTA AND IN THE CORPUS LUTEUM

Preliminary Report[1]

By ROBERT T. FRANK, A.M., M.D., New York, and JACOB ROSENBLOOM, M.D., Ph.D., Pittsburgh,
From Columbia University, George Crocker Special Research Fund, F. C. Wood, Director

THAT the ovary and the corpus luteum are glands of internal secretion is a statement which requires no discussion, but it has not as yet been fully determined that the placenta may also be classed as belonging to the same group. Although all the earlier injection experiments with ovarian substance and corpus luteum extracts were unsatisfactory in demonstrating absolute identity between the action of the substances as administered and the supposed physiological and anatomical effects of the substances as secreted by the undisturbed organ — a fact which was demonstrated by one of us (1) some time ago — in the last few years a distinct advance has been made in the study of experimental ovo and lutein action. The work of Fraenkel (2), Villemin (3), Drevet (4), and others, with corpus luteum and ovarian extracts, and the experiments of Starling (5) with placental and fœtal extracts, have not been convincing (6); but the more recent reports by Iscovesco (7), Aschner (8), Seitz, Wintz, and Fingerhut (9), and, finally, Herrmann (10), show distinct progress, due apparently to a new method of preparing the extracts. While on first examination it would appear that success had been attained because these authors extracted the lipoid or fatty content of the organs and used the lipoid for injection, it is probable that further study will show that the results are due not so much to the use of the lipoid as to the enormous concentration of the active substance, whatever this may eventually prove to be. Formerly aqueous or saline extracts of ovary, corpus luteum, or placenta were employed, and in these the active substance, which is insoluble in water, was present only in minute quantities; while today extracts are made with alcohol, ether, or other fat solvents, so that the active substance, which apparently either is a lipoid or is carried along by the lipoid of the organ, is greatly concentrated, and, therefore, should evidence its physiological effects to a much greater degree. This is actually the case. Some investigators believe that the potent

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substance is a lipoid; others think that it is a protein in conjunction with a lipoid; and still others, as Herrmann, claim that it is simply carried along by the lipoids, and that after the lipoids have been removed the remainder contains the active substance. Whatever the nature of the substance may be, however, there is no doubt that positive results have been obtained by various experimenters in the last two years, although none of them agree exactly as to the nature of the substance employed or as to the method of preparation.

For a year we have been testing the biological action of extracts of placenta and corpus luteum. The first experiments were made with an extract containing all of the alcohol- and ether-soluble substances; in a second series, the extract used was composed of two fractions, one containing the substances extracted with acetone, the other, the substances insoluble in acetone; while in a third series, the fractionation was carried to a further degree — alcohol, ether, acetone, and chloroform soluble substances being separated.

As this is a preliminary communication and the work has not yet been completed, it will suffice for the present to give a general description of the experiments, without extensive details as to the quantities employed, the methods used, etc., merely indicating the results in a broad and general way.

Methods. The extracts were emulsified either in normal salt solution or in a combination of normal salt solution and olive oil, the object being to obtain a smooth and permanent emulsion.

Animals. In order to obtain an approximately constant physiological object for experimentation, the following method was employed: Rabbits of about the same age and weight were selected, and on these double lumbar oöphorectomy was performed, a portion of the left uterine horn being removed at the time and kept for additional control. As is well known, the uteri of castrated rabbits of the same age and weight attain an approximately stable condition of atrophy in the course of four or five days, the atrophy remaining at about the same degree for two to three weeks. For the sake of convenience and brevity, this neuter and stable condition of the uterus will be designated the "castrate norm." In every instance the "castrate norm" showed distinct involutionary changes compared with the portion of the uterus removed at the time of oöphorectomy. The castrated animals were injected with the extracts to be tested, and after a period varying from fourteen to twenty-eight days they were killed and their uteri examined. For comparison there were at hand the horn removed at the time of castration, the "castrate norm" for rabbits of a given weight, and, finally, the uterus as found at the time of death. The macroscopic appearance of these uteri was noted, and cross sections at various levels were made for microscopic examination.

Fig. 1. Uteri of rabbits injected with placental extracts. The short piece of uterus seen to the left of each figure is a segment of the left horn removed at the time of oöphorectomy. Uterus 171 was from a rabbit injected with acetone-soluble placental extract with positive effect; uterus 170 from an animal injected with acetone-insoluble extract without effect.

Methods of exhibition of the extracts. In almost all of the experiments rabbits were in-

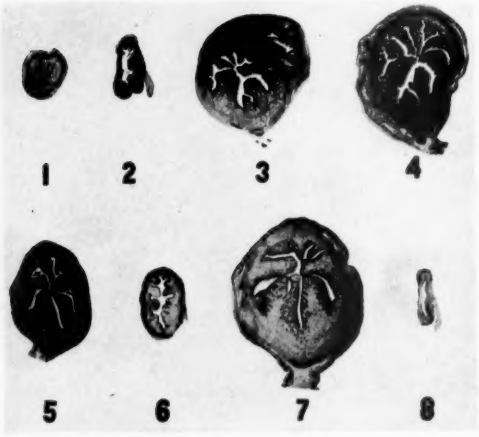

Fig. 2. Cross sections of rabbit uteri (low power). 1, Unoperated control; 2, castrate control, five days after operation (castrate norm); 3, castrate after fourteen injections of placental extract; 4, castrate after fifteen injections of boiled placental extract; 5, castrate after 24 injections of corpus luteum extract; 6, horn removed at time of castration (Fig. 1, uterus 171); 7, uterus of same animal (castrate) after fourteen injections of acetone-soluble placental extract (Fig. 1, Uterus 171); 8, uterus of castrate after fourteen injections of acetone-insoluble placental extract (Fig. 1, uterus 170).

Fig. 3. Cross sections of rabbit uteri (low power). 1, Horn removed at time of operation; 2, castrate after feeding alcohol-soluble placental extract by mouth for eleven days; 3 and 4, before and after injections of alcohol-soluble placental extract (11 injections); 5 and 6, same as 3 and 4, using smaller doses of extract.

jected subcutaneously with the emulsions used, the site of injection being as far as possible from the abdominal breasts in order that local reaction might be avoided; and after each injection the area was massaged so as to increase the rapidity of absorption. As a rule, injections were made daily. In most instances the animals lost weight rapidly but they rarely died as a result of the injections. In a few experiments the drugs were given by mouth through a stomach tube.

Effect of placental extracts. Animals injected for fourteen successive days with extracts of placenta showed an enormous hypertrophy of the uterus, the organ having increased in thickness, in length, and in weight. Its surface was distinctly congested, and on the whole it resembled a uterus one to two hours post-partum. This condition was seen in rabbits weighing as little as 450 grams, that is, in animals which had not reached the age of puberty. On cross section, the uterus showed an enormous increase in all layers, the musculature and mucosa being equally hypertrophied. The epithelium and glandular structures of the mucosa showed distinct activity, although mitoses were extremely rare. Some desquamation of the epithelium was noted at times. The extracts containing all the fat-soluble substances were found to be by far the most potent. The fraction containing these substances, the alcohol, ether, acetone, and chloroform extracts, gave an active physiological effect, but this was distinctly less, quantitatively, than that of the entire, unfractionated placental extract, while the fractions not soluble in lipoid solvents proved to be completely inert.

Effect of corpus luteum extracts. The results of injections with extracts of corpus luteum were less striking, and, as will shortly appear, at first proved to be very confusing. The first experiments were made with the unfractionated corpus luteum extract. This proved to be almost as potent as the placental extract, only slight differences, if any, being apparent both macroscopically and microscopically. The hypertrophy was nearly as marked as that seen after injections of placental extract, but appeared only after twenty to twenty-eight injections had been given.

Congestion of the surface of the uterus was never very marked. Microscopically, all layers showed hypertrophy; the mucosa seeming to be thicker than that seen after placental extract injections. Desquamation was rarely noted, and mitoses were no more frequent than after the use of placental extract. Succeeding fractions, however, proved to be entirely inert, although alcohol, acetone, and chloroform were used in the fractionation. Upon inquiry it was found that Armour and Company, to whose kindness we were indebted for the large quantities of fresh corpus luteum substance used for extraction, had "degreased" two batches because it had been thought that this would make the substance more stable. Naturally, in the process of degreasing with either alcohol or ether, the lipoid substances were removed, and the mass received by us proved to be inert. The unfractionated extracts of a further batch of non-degreased corpus luteum substance, however, proved to be equally inert. In the last instance the substance was derived from non-pregnant animals, while the first corpus luteum substance extracted, and the only one found to be active, was derived from pregnant animals.

Summary of results. From the foregoing it is apparent that the claims made by certain investigators (*loc. cit.* 7 to 10) can be, at least partially corroborated. By means of concentration, active corpus luteum and placental substances are obtainable. If not identical, the substances contained in the two glands, the placenta and the ovary, are at least very similar in action. As no chemical entity has been isolated, no quantitative comparison between the efficacy of placental and of corpus luteum active substances can be made. The effect upon the mammary gland of placenta and corpus luteum extracts in the concentration used is apparently slight, but whether this will apply in an equal degree to a more concentrated extract is yet to be determined. Extracts of the corpus luteum substance of pregnant animals appear to be more effective than those of non-pregnant animals. The fact that unfractionated placental and corpus luteum extracts were quantitatively more efficacious than any of the fractions obtained, makes it appear probable that the active substance is not a lipoid but is carried along the lipoids. At present, the employment of these unpurified extracts clinically is entirely out of the question, because the toxicity of the mass of lipoids is considerable, as was shown by the emaciation of the animals. Furthermore, when the extracts are given by mouth a distinctly poisonous effect was sometimes observed; but whether this was due to autolytic products of decomposition (cholin?) or to anaphylactic phenomena was not determined.

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DEPARTMENT OF TECHNIQUE

OPERATIVE TREATMENT OF BAD RESULTS AFTER FRACTURE[1]

By JAMES E. MOORE, M.D., Minneapolis, Minnesota

THE subject of operative treatment of bad results after fracture is chosen because every practitioner treates fractures, and we all get some results that are far from satisfactory. It has always been an interesting subject, but its interest has been greatly increased since the advent of the skiagraph, for it not only aids us in diagnosis and treatment, but it makes our mistakes more apparent. A result that is satisfactory from a practical standpoint may show marked displacement and deformity in a skiagraph. Advantage has too often been taken of this fact by those who are anxious to bring suit for malpractice.

The two great misfortunes that may follow a fracture are first, non-union, and second, deformity accompanied by disability.

Our ideas concerning the causes of non-union have been materially changed within the past few years. We have learned that syphilis is not so frequent a cause as we formerly believed. Dr. Abbott, of St. Paul, recently reported a series of severe fractures among a group of miners, most of whom were suffering from syphilis and there were no cases of non-union. Age was formerly believed to be a frequent cause of non-union, but the fact is that most cases of non-union occur in persons in middle life, youth and age being comparatively exempt. This mistake was doubtless due to the fact that fracture of the neck of the femur, which occurs most frequently in the aged, was so commonly followed by non-union. Within a few years, however, we have learned that the reason for non-union in these cases was that the fragments were not brought in apposition by our former methods of treatment, and that when the fragments are brought in apposition by modern methods of treatment they unite in the majority of cases. We have also learned that, contrary to our former belief,

Fig. 1. Skiagraph of impacted fracture of the neck of the femur.

Fig. 2. Graft placed in medullary cavity.

[1] Read before the North Dakota Medical Society, Bismarck, North Dakota, May 12, 1915.

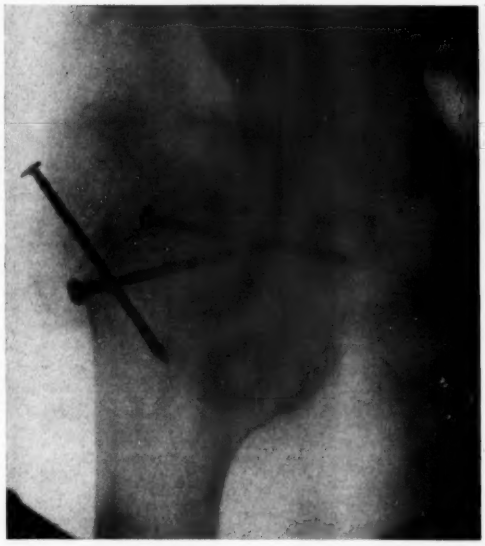

Fig. 3. Skiagraph shows replaced trochanter in patient operated upon after using crutches two years.

fracture of the neck of the femur is quite common in youth and childhood. Non-union in these young people is practically unheard of, because the fracture is usually of the "green stick" variety and the fragments are not separated.

Fig. 4. Pott's fracture.

Fig. 5. Pott's fracture.

Many of the cases of coxa vara are really cases of unrecognized fracture of the neck of the femur which have united in a faulty manner for lack of proper treatment. Figure 1 was taken of a lad of fourteen years who came to the University Hospital in March, 1913. In September, 1912, while plowing, the horse stumbled and the plow "kicked" him on the right trochanter. Although he felt some soreness and disability he continued to work until January, 1913, when he fell on the ice. He walked on the limb that day, but by evening he was unable to move the joint and experienced pain when he walked. He was obliged to use crutches up to March, when he entered the hospital. Upon admission he could not walk without pain, his hip was quite

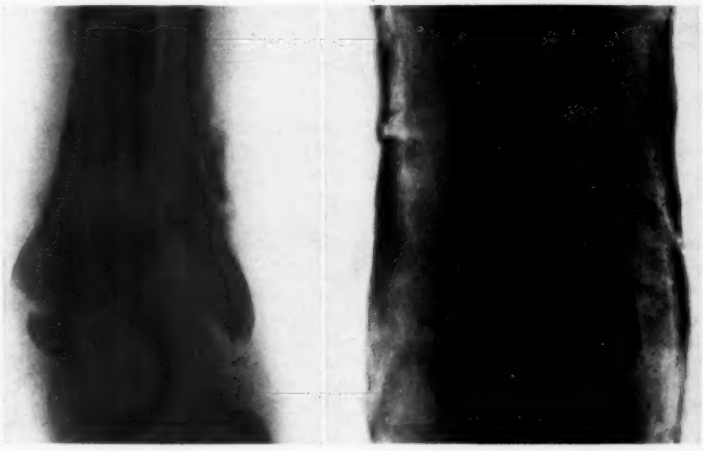

Fig. 6. Fig. 7.

Fig. 6. Pott's fracture.
Fig. 7. Showing astragalus directly under the tibia so that the body-weight falls upon it without causing eversion.

Fig. 8 (above). Ulna broken into fragments and the head of the humerus dislocated forward.
Fig. 9. Resulting deformity from fracture shown in Fig. 8.
Fig. 10. Result of sewing neighboring fascia over bony surface to prevent union between radius and ulna.

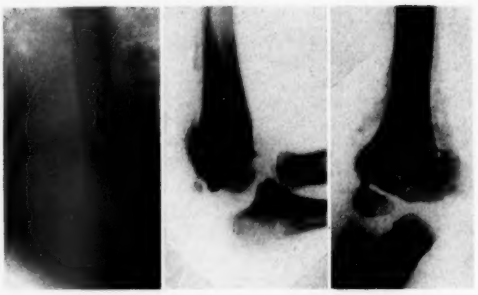

Fig. 11 (left). (Velma Horn.) Lateral oblique fracture before repair, six days after injury.
Fig. 12. Same case as Fig. 11. Two weeks after operation. Flexion from primary position 20°.
Fig. 13. Same case as Figs. 11 and 12. Three weeks after operation. Arm in voluntary extension.

stiff, there was three-fourths of an inch shortening, marked eversion, and the skiagraph showed an impacted fracture of the neck of the femur. There was bony union at this time, and he was sent home without treatment.

Doubtless many cases of non-union have been due to the presence of muscle and other tissues between the fragments. In other words, the fracture had not been properly reduced. At the present time, by the use of the X-ray, we can learn to a certainty when the fragments do not come in contact, and when they cannot be brought in proper relation by manipulation we adjust them through an open wound. There is, therefore, no longer excuse for non-union due to improper adjustments of the fragments.

There remains, unfortunately, a large number of cases of non-union for which the surgeon is in no way responsible, and for which until very recently he has been able to do very little. These cases occur in persons who, for reasons that we do not understand, have not the power of producing osteoblasts, and no matter how well the fragments may be adjusted non-union will follow. The patient may be, and usually is, a healthy individual, for fractures usually occur in healthy people; he may not be suffering from syphilis or any constitutional disease, and may not be addicted to the use of alcohol, and yet be unable to produce new bone-cells. It is in this class of cases that we have so often failed to secure bony union by operation. It is utterly useless to apply a Lane's plate, for that hinders rather than promotes the production of osteoblasts. Wiring is equally inefficient. Fortunately we are now able to secure bony union in a large percentage of these cases by the use of the bone graft. The graft is believed by some surgeons to have osteogenetic properties of its own, because instances are on record in which the bone graft has been broken and afterward united. The writer does not understand how a strip of bone taken from one part of a patient's body can be expected to have osteogenetic properties when he has failed to produce osteoblasts in another. The presence of the graft undoubtedly stimulates osteogenesis in the original bone. We have been very successful in this work in the University Hospital. Through defects in our technique we have sometimes failed to secure results by our first operation, but have ultimately secured them in all but one instance, and that patient has recently been reoperated upon. We have learned that grafts from the patient's own person are the best, and that grafts covered by periosteum act more

quickly. While the part played by the periosteum has been greatly overestimated in the past, there is no doubt in our minds but that the presence of periosteum on the graft aids osteogenesis. Whether the periosteum has real osteogenetic properties is still a disputed question.

There are three accepted methods of bone grafting: First, that of Buchanan, in which a piece of bone is removed from each of the two fragments, one long and the other short. The fragments are then transposed so that the long graft bridges over the seat of fracture. This is the method the writer has employed in most of his work. It is eminently satisfactory, and it can be done with the mallet and chisel better than can either of the other methods. The grafts can be held in place by chromic catgut passed around the bone and tied over the graft, or by drilling a small hole transversely through each fragment through which is passed a strand of kangaroo tendon which is tied over the grafts. This is Albee's suggestion.

The second method, suggested by Murphy, consists in reaming out the medullary cavity in each fragment and introducing the graft into these openings so that it extends beyond the area of eburnated bone in both fragments. Figure 2 shows a case in which the first graft was placed in the medullary cavity and resulted in failure because it did not extend beyond the eburnated bone in one of the fragments. A second transplant was applied by the method to be described later, and union is taking place but for lack of time is not yet complete. The remains of the original graft can be seen. The objections to this method are that the transplant must be comparatively small and is liable to be broken when the patient moves his limb, and it is quite difficult to so adjust the transplant that it extends well beyond the eburnated bone in both fragments, and this is absolutely necessary because the eburnated bone has very little if any osteogenetic properties.

This third method of applying the bone graft is the favorite method with most surgeons, but requires the electric saw to perform it properly. It is performed by properly adjusting the two fragments, after which the periosteum is incised and turned back so that it can be stitched over the graft after it has been placed in the groove. Then by means of an electric bone saw with two parallel blades two grooves are cut in each fragment. These grooves should extend into the medulla and beyond the hardened bone in each fragment. The bone between the grooves is then severed at either end by a chisel and removed, leaving a deep, smooth-sided gutter. A strip of bone is then removed from the patient's tibia with the same saw with the same adjustment, and placed in the gutter made in the fragments. Made in this manner the graft fits accurately, and can be held in place by closing the soft parts snugly over it, or by Albee's method without the necessity of introducing any unabsorbable material. The wound is then closed without drainage, and a plaster-of-Paris splint applied over the surgical dressings. Whenever practical it is very desirable to extend the plaster splint beyond the two neighboring joints so as to prevent motion and strain upon the graft.

Operations for the relief of deformity and disability are very difficult and no two of them are alike. While the results are often disappointing, they are frequently very gratifying to both patient and surgeon. When we undertake these operations we should make no promises of perfect results, for they are not to be expected, and the possibility of failure should be clearly stated. These patients are often willing and sometimes anxious to take the chances of improvement when the surgeon promises to do his best and offers hope of improvement. The principal care of the surgeon should be that he does no harm.

It is impossible to cover this whole subject in one paper, so I have selected a few cases to illustrate the possibilities of this work.

We all meet with patients suffering from disability following fracture of the neck of the femur. The condition is almost invariably non-union from lack of proper adjustment of the fragments. A certain number of these patients can be secured a good useful limb by operation. The patient must not be too old, and must be in good health, because the operation is a severe one and the patient will be confined to his bed for a number of weeks. It must be remembered that it is only the select few of these patients that can be operated upon with any hope of success.

Figure 3 was taken of a patient upon whom I operated after he had been obliged to use crutches for two years, and the result was a good useful limb and the abandonment of the crutches. The joint was reached by a large U-shaped incision with its base above the trochanter and its apex downward, extending through the fascia lata to the muscles. This flap was turned up and the great trochanter sawed off and turned up, permitting access to the joint from the front. The broken surfaces were then freshened and the fragments fastened together by two steel nails. The third nail seen in the skiagraph was driven through the replaced trochanter to hold it in place.

Pott's fracture is a very common cause of deformity and disability which, fortunately, lends itself admirably to operative treatment. The two following photos (Figs. 4 and 5) were taken of a patient upon whom I operated

many years ago. As you see, he had sustained a Pott's fracture which had left him with a deformed foot, so disabling him that he was unable to follow his trade as a plumber. An osteotomy was performed upon the tibia and fibula, the foot forced into a position of overcorrection and held there by a plaster splint. The result was that the patient was able to work at his trade very comfortably.

The next two skiagraphs were taken of a patient referred to me by Dr. Wallace of St. Joseph, Mo. This patient was thrown out of a wagon in a runaway and sustained a complicated Pott's fracture, as shown in Fig. 6. I first saw him about five weeks after the accident. Bony union had taken place, but the foot was so badly everted that the weight of the body transmitted through the tibia fell inside of the astragalus. A wedge-shaped piece of the soft new bone was removed from between the fragments of the tibia through a longitudinal incision, and the lower fragment loosened. A longitudinal incision was then made over the site of the fracture in the fibula. The fibula was broken by an osteotome, the lower fragment turned down, and the new bone chiseled out from between the tibia and fibula. The foot was then inverted as far as was possible with the unaided hands of the assistant and myself. The wounds were then closed and a plaster splint applied. The result, as shown by a skiagraph, taken the next day, was not satisfactory, because the astragalus was still too far out to receive the transmitted weight from the tibia properly. The foot remained at such a mechanical disadvantage that the tendency would have been for it to become more and more everted when the patient walked. The patient was anæsthetized on the following day, the splint and most of the dressing removed, and heavy pressure applied over the outer side of the foot and outer malleolus by means of an osteoclast, such as is used by orthopedists for breaking bones. The result was marked improvement, as shown in this skiagraph (Fig. 7). Although the picture shows that the astragalus is not as far in as nature intended it to be, the foot was decidedly inverted. This picture shows the astragalus directly under the tibia so that the body weight can fall upon it without causing eversion. Some of the stitches were broken at the second operation, allowing some gaping of both wounds. These were replaced and a plaster splint applied over moderate sized surgical dressings with the foot in an overcorrected position. *It should be noted that no foreign material was introduced to retain the fragments in place.* When sufficient force has been applied to overcorrect the deformity, nails or screws are not necessary, and they should always be avoided when it is possible. The convalescence was comparatively uneventful, and there was remarkably little pain. On account of the œdematous condition of the tissues at the time of operation, and the severe contusion at both operations, primary union was not complete, and a small piece of the fibula became necrotic and was removed, but at no time was there a deep infection. The patient left the hospital in three weeks with both wounds nearly healed. I have not seen him since he left the city, but in less than two months after the operation he reported to me that he was delighted with the result, because he had thrown away his crutches and could walk without a limp or pain. He stated that the motion in the joint was almost normal. The difficulty in correcting the deformity in this case was due to new-formed bone and other tissues, and it is very evident that a lesser degree of pressure applied shortly after the accident would have secured as good, and possibly a better, result. The writer would suggest that the osteoclast be used in recent cases of Pott's fracture, applying a sufficient force to place the foot in a position of overcorrection.

The next case was a patient who came to the University Hospital because of ankylosis of the elbow-joint following a fracture of the condyles occurring nine months previously. The loss of motion was due to the bridge of new bone in front of the joint. This bridge of bone was chiseled away by Dr. A. A. Law of our staff, and the neighboring fascia brought over the raw bony surface to prevent a new formation of bone. The immediate result after the operation was very satisfactory, for motion was almost completely restored. The patient returned fourteen months later, complaining of increasing loss of motion in the joint. A large growth of bone had formed on the anterior surface of the humerus. Dr. Law again operated, removing the projecting bone and covering the raw surface with a piece of periosteum taken from the patient's tibia. The immediate result was quite satisfactory, but it is too soon to know what the final result will be. This case illustrates one of our greatest difficulties in this work. There is a persistent tendency to the reformation of new bone, especially between bones as in the forearm. Our only hope seems to be in the use of periosteum or firm fascia, like the fascia lata, to act as a limiting membrane to keep the osteoblasts within bounds. At the second operation in this last case the new bone was so deeply buried in newly formed connective tissue that it was difficult to reach it, showing that a transplanted fascia with a function to perform has a tendency to grow and develop.

The next three pictures were taken of a lad of fifteen years, a patient of my associate, Dr. Arthur C. Strachauer, who was injured in an explosion. The first skiagraph (Fig. 8) shows the ulna broken into a number of fragments and the head of the radius dislocated forward. The next picture (Fig. 9) shows the resulting deformity and a firm bony union between the radius and ulna. When first seen, six months after the accident, pronation and supination were absent, there was very limited flexion and extension, and he could not reach his nose or mouth. Dr. Strachauer operated at the Northwestern Hospital. An incision was made over the head of the radius with the hope of reducing it, but it was found immovably fixed and osteoporotic from disuse, and was excised. An incision was made over the outer side of the ulna, the bone broken with an osteotome, the ends turned out and the bony deposit between the radius and ulna removed with chisel and rongeur. A Lane's plate was then applied to the ulna at the seat of fracture to maintain reduction, and to hold the ulna away from the radius. The neighboring fascia was sewed over the raw bony surface to prevent union between the radius and ulna. The result is shown in the next picture (Fig. 10). Six weeks after the operation the patient had complete flexion and extension, with rotation of from one-half to two-thirds of normal, and he could touch the back of his neck, the top of his head, and could reach his nose and mouth. On account of the persistent tendency to the reformation of bone between the radius and ulna in these cases this patient will doubtless lose some of his rotation, but even then will be in a much better condition than he was before the operation.

The next three skiagraphs were taken of a girl of seven years, also Dr. Strachauer's patient, who was injured by a fall. As you will see (Fig. 11), there was posterior and lateral dislocation of the radius and ulna, and fracture of the external condyle of the humerus with wide separation of the fragment. Repeated efforts had been made at reduction but had failed, so an incision was made over the posterior aspect of the joint, the orbicular ligament repaired with chromic catgut, and the condyle fastened to the shaft of the humerus with a steel nail and the wound closed in the usual manner. Figure 12 was taken two weeks after the operation, with the arm in voluntary flexion. Figure 13 was taken three weeks after operation,

with the arm in voluntary extension. Six weeks after the operation all motions of the elbow and forearm were perfect. This will be a permanent result because the operation was performed soon after the accident.

The illustrations shown demonstrate how difficult these operations are when delayed, and how much easier they are and how much better the results when the operation is done soon after the accident, before Nature has undertaken repair with the parts in a faulty position, and make a strong plea for early operation.

In every case of fracture of the elbow, and in every case of Pott's fracture when reduction cannot be accomplished by manipulation, operation should be resorted to before new bone has commenced to form.

THE CONSTRUCTION OF AN ARTIFICIAL VAGINA WITH ESTABLISHMENT OF THE MENSTRUAL FUNCTION[1]

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IT is not my intention in this short paper to go into a discussion of the propriety of making a patient go through the dangers of a major operation in order to make a vagina for her if she has not a functioning uterus. There is no question but that she can go through life quite comfortably, so far as physical comfort is concerned, without genital organs; but when the psychic aspect is considered it is quite a different proposition, and much can be said on both sides. My own views on the subject are very simple. I believe that the sexual life is very important for the happiness of a very large proportion of mankind, and if a girl finds that part of life is impossible for her she is likely to brood over the loss and imagine it even greater than it is; so, if she, fully understanding the danger of the operation, still wishes to have it performed, I am perfectly willing to try to remedy the defect in her anatomy. So far as the present case is concerned, however, the question did not come up, for a functionating uterus was present; and I think that there is no surgeon but who would say that with blood damming back in the womb each month, operation of some kind is imperative.

The ideal of surgery is to make the body as nearly normal as possible; so instead of removing the uterus and stopping menstruation, if the vagina is absent, I believe a vagina should be made, to form an outlet for the menstrual flow. This procedure will also make the woman fit for marriage if she ever desires to marry.

In the past ten years several operations have been devised for the purpose of making an artificial vagina, and they have all been tried successfully in a few cases. Before that time the plastic operations devised tried to line the canal with skin flaps from the thighs or vulva or with peritoneum from the cul-de-sac of Douglas; but they were almost all failures, as the flaps would slough and the vagina contract and be worthless.

In 1897 the first advance was made: Gersuny (1) tried to cover the canal with mucous membrane. He cut it from the rectum and was fairly successful in maintaining a canal, though it was necessary to wear a pessary. In 1904 Dr. Baldwin (2) of Columbus devised the first completely successful method; in 1907 (3) he first tried it, and in 1912 (4) he reported that he had had six cases, all successful. He resects a portion of the ileum and draws it down into the pelvis with the mesentery still intact. Several others also have tried this method. Dr. Boldt (5) of New York has had 2 cases; Dr. Stewart (6) of Philadelphia, 1 case; Dr. Kerr (7) of Glasgow, 1 case; Dr. Bonney (8) of London, 1 case; Dr. Phillips (9) of Sheffield, 1 case; and Dr. Wright (10) of Buffalo, 1 case. Of all these cases I have been able to find the original reports, and there are several others, too, which have been alluded to, but which I could not trace. All these cases have been successful.

The Germans prefer to work from below. Dr. Albrecht (11) has had three cases in which he made the vagina from the sigmoid, and Drs. Schubert (12) and Strassman (13) between them have had nine cases. They utilize the rectum and think it a much simpler and less dangerous method. Never having seen or tried their method, I am not qualified to compare it with the Baldwin method which I used in my case.

Miss D. F., schoolgirl, age 13, is still very much a child in her makeup, of the long and lanky type, loose-jointed. At times one of the synovial fringes would catch in her

[1] Read before the Medical Society of the County of Monroe, May 18, 1915.

left knee-joint, and would often make her fall. The knee would be swollen and tender for two or three days afterward. She has always been troubled by enuresis, sometimes in the daytime as well as at night. She was a frail child, but had no severe illnesses.

In the fall of 1913 she had three similar and rather peculiar attacks. The attack began with a sharp crampy pain felt across the lower abdomen and also in the epigastrium. This was followed the next day by vomiting at short intervals all through the day, and urination was very painful. The quantity of urine was small. There were four or five loose stools. There was a little tenderness in the hypogastrium, but no rigidity at any point. These symptoms lasted for a couple of days and then cleared up and she was apparently entirely well.

But she had had two other attacks just like this, one in November and one in December, and then I began to realize that they were just six weeks apart. The periodicity being established immediately suggested some obstruction to the menstrual function, for up to this time she had never flowed. In January again the pains came on sharper than ever, and I urged a vaginal examination under ether. Between the anus and urethral meatus there was a blind sac not more than three-fourths inch in depth. A rectal examination showed the uterus and ovaries to be present. Diagnosis of congenital absence of vagina was made and operation advised.

She was admitted to the Rochester General Hospital February 13, 1914, and the next day the operation was performed. A careful dissection was made between the bladder and rectum, and at a depth of about three inches from the incision of the mucous membrane the cervix was reached. It was grasped with a double tenaculum and pulled down, the connective tissue around it being peeled back, until finally the mouth of the cervix was exposed; a dilator passed into it revealed about an ounce of black, tarry blood in the uterus. This was evacuated, and the cavity of the uterus, which was a little longer than normal, wiped out with gauze. It was then packed with iodoform gauze, as was the cavity for the new vagina. It took about an hour to do this much of the work, and as the patient was a frail child, it seemed wise to stop here and not attempt the bowel resection until a second sitting.

On February 19 the second part of the operation was done. The incision was made in the median line. The cæcum was located and a loop of small intestine twelve inches long just proximal to it was selected which when doubled will reach well down through the pelvis to the vulva. The loop was isolated by rubber-covered clamps and separated from the rest of the intestine, but was left attached to its own mesentery. The distal end of the isolated loop was closed by a purse-string suture of silk, and half of a Murphy button was dropped into the short end of the ileum attached to the cæcum; the other end of the loop was cleansed but not closed, and the other half of the Murphy button was introduced into the proximal end of the ileum. The isolated loop was now freed by making radiating incisions into the mesentery at each end to a depth of about three inches, which allowed the loop to be pulled into the pelvis without cutting off its blood supply. Putting together the two halves of the Murphy button restored the continuity of the small intestine, and the cut edges of mesentery were sutured together, closing the gap in the mesentery and covering over the raw edges. Then I opened the peritoneum into the cavity which I had made at the first operation, and with a forceps drew the doubled loop of intestine down to the vulva, stitching the open end around the cervix. Placing these sutures was the most difficult part of the whole operation, as the anterior lip of the cervix was almost impossible to reach from above. I now believe I could have placed these sutures more easily from below. This finished the abdominal work. I closed the abdominal incision rapidly with through-and-through silkworm-gut sutures, then opened the loop of intestine at the vulva and stitched the edges there, packing both limbs of the intestinal loop with iodoform gauze. Great care had been taken to avoid all roughness in handling the intestines, but the amount of work done required two hours of time. She left the table with a pulse of 180 and very weak. As she came out from the ether her condition was desperate, pulse 200, hardly palpable even in the neck, color very bad. She was given saline and strong stimulation, and fortunately she had just enough vitality to carry her over the period of shock. By midnight her pulse had dropped to 150 and by the next morning it was 126. Her convalescence was uneventful and she went home before the end of the third week, and in another two weeks was getting up and around.

The loop of bowel did not slough at all, but has become fixed in its new position; and now, over a year afterward, she has a perfectly good vagina, though a double one, as I have not yet crushed the septum between the two loops.

I have had some difficulty in maintaining the connection between the uterus and the new vagina. At the time of the operation I found it very difficult to suture the end of the intestine to the cervix, and later it slipped away, leaving the cervix just above the new vagina. So I had to cut through the wall again at this point into the cervix and again suture the mucous membrane around it; I then introduced a silver stem pessary such as Carsten uses for dysmenorrhœa. Now the girl is menstruating naturally and painlessly.

The case has been a very interesting one to me. The operation was performed almost exactly as Dr. Baldwin described it, but it differs in one particular from the cases he has done. In all his cases, and in all those I have been able to follow of other operators, the uterus has been either absent or diseased; so they have simply built a vagina without connecting it to a uterus. This I believe is the first case on record in which a vagina has been successfully made and connected with a functioning uterus so that the regular menstrual function has been established.

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THE MANAGEMENT OF DEFICIENT LACTATION[1]

By N. SPROAT HEANEY, M.D., F.A.C.S., Chicago

ALL will agree that the ideal food for the infant is mother's milk and that an insufficiency in supply is a common occurrence. When breasts are deficient, or the child, because of an anatomical deformity, cannot nurse, the reason for a failure in lactation is apparent. We find, however, even when anatomical conditions are perfect that the child frequently fails to gain in weight, and eventually under ordinary conditions of practise, the child has to be raised on the bottle.

The failure of the breasts to engorge on the second to the fourth day is so rare an occurrence that it can be said that the breast reaction always occurs. This reaction signifies the appearance of milk. Unless the child nurses or the milk is withdrawn otherwise, the breasts gradually dry up, and milk is no longer secreted.

Usually the nursing reflex is strongly developed at the time of birth, but frequently we find that large, normal-appearing, full-term babies, make no effort whatever to nurse, and, if they do attempt to nurse, the effort is short in duration and they promptly fall asleep. These infants continue to lose in weight, and usually excite no particular attention until they get into a dangerous condition. Every effort must be made to keep such a child awake while at the breast. Cold applications to the feet, or other forceful irritation, must be employed. If the infant does not nurse, the breast must be pumped or else lactation fails. If insufficient breast milk is obtained to nourish the child, artificial food must be supplemented. As soon as the babe secures sufficient food, it usually awakes from its lethargy and begins to nurse normally. Early attention must be paid as to how well the newborn nurses, so that requisite means of relief may be given in time to prevent failure of lactation. An indolent infant must be given plenty of water to drink, and much stress must be laid upon this rule in nurseries where water is generally used as a pacifier and where such an infant is left undisturbed because it so rarely cries. A deficiency in water is usually responsible for large losses in weight during the first three or four days.

When a normal baby does not begin to gain in weight after the mother's milk reaction has occurred, a prompt investigation of the cause must be instituted. The child is weighed before and after each feeding to ascertain the amount of milk obtained. An average of three ounces to a nursing is requisite for a daily gain if the child is of normal size and is nursing six times daily. After the child is removed from the breast, the breast is pumped or milked manually to see if residual milk is present. It should be noted also whether the milk escapes readily in several streams or whether it issues slowly and through but one or two ducts. There is just as great a variance in mothers in this respect as is met in the animal world. If milk gushes from the breast after the child has obtained an insufficient amount, the child is apathetic. The breasts may feel still fairly full and the pump show that the milk escapes slowly and in but one or two very thin streams. The milk may come with such difficulty through an insufficient number of ducts, that the newborn babe becomes exhausted before it can obtain a sufficient amount. Later, however, with increased strength it may empty the breasts in a very few minutes. In all cases where residual milk is left, the breasts should be thoroughly emptied or milk secretion will fail. This fact should be as well appreciated by the obstetrician as it is by the dairyman.

No breast pump is so efficient as a strong child that knows how to nurse. In the light of our present knowledge regarding syphilis, however, no strange child should be applied to a woman's breast unless both mother and child have negative Wassermann reactions. The variations and failures of this test to detect syphilis, however, make it imperative that this means of stimulation be employed only in extreme instances.

When the fault is with the breast, when we are dealing with an absolute deficiency of milk, the most efficient galactagogue is stimulation of the breast by withdrawal of the milk present. The demands on the breast as a means of increasing supply is seen during the course of every lactation. The newborn will empty the mother's breast when it has taken three to four ounces while months later the same breast may yield ten ounces at a nursing.

When we have demonstrated that the case at hand is one of deficient lactation, it is necessary to take into consideration a great number of details when trying to rectify the condition.

The mechanism of lactation is a very delicately balanced affair during the first weeks and is very easily influenced adversely. The effect of emo-

[1] Read before the Chicago Gynecological Society (for discussion see p. 664).

tions upon secretions in general is very well established and is well known. Nowhere is this effect more marked than upon lactation. A fright has more than once been noticed to be followed by a decrease or absence of milk. An irritating nurse or husband or a bickering mother-in-law may have such an emotional effect upon a new mother as to seriously interfere with her milk production. Painful impressions and sleeplessness and all things which interfere with the psychic rest of the patient may decrease the secretion of milk. Unhappiness and discontent may have their bad effect. These factors are only transitory in action if removed early, but if long-continued the deficiency in secretion may be permanent. A change of surroundings may work wonders toward building up a plentiful supply of milk. A change of nurses may be a necessary treatment. In a resistant case sending the patient home from the hospital is frequently followed by an abundant milk production. So that a psychological study of the patient and her family often has to be instituted in order to obtain results in this field.

The physical condition also has to be taken into consideration. A patient who has had a severe hæmorrhage often has a late milk reaction and a deficient milk supply. A continuous drain through profuse lochia in the puerperium may have a similar effect. In this regard, however, it must be remembered that ergot may impair lactation.

The patient's general condition must be improved in every way. An abundance of nourishing food is very helpful, but cramming may be harmful if it results in indigestion. No particular food or medicine has a specific action as a galactagogue. In a former paper[1] I showed that the claims for pituitary extract were based upon faulty experimental work. Occasionally, an individual may have an idiosyncrasy for some particular food. One patient was extremely annoyed by painful engorgement and marked leaking of the breasts each time she ate fresh pork; another had a similar experience each time she ate ocean fish; neither had such reactions at any other time. None other of my patients has noticed peculiarities toward certain foods and I have questioned many of them. A mixed diet is advised and no particular stress is placed upon milk-making qualities, for such special peculiarities do not exist. The belief that the constituents of the milk can be influenced by food is held only by those not acquainted with the feeding experiments in dairy herds. An individual woman has milk of a certain quality and this approximate quality will be maintained under all conditions of food taking. A milk analysis is of no worth whatever in the management of breast nursing.

The attention given to the act of nursing itself is of the utmost importance when wishing to restore lactation to its proper level. The child is put to the breast and allowed to nurse for not longer then 15 to 20 minutes. If the amount taken is not 3 ounces, when the child nurses six times daily, the deficiency is supplied with pumped milk or artificial food.

If no great variation is met in the amount nursed at the several times, an average is struck and a fixed amount of supplementary food is given each time. If one breast is small and a marked difference in secretion is determined, the child may be put a while on the good side after each nursing on the defective side. In many cases, a sufficient amount may be obtained if both breasts are given at each nursing. If the supply of breast milk is to be increased, care must be taken not to give too much supplementary feeding, since, if the child gets too much from the bottle, it will not nurse the breast properly at the next nursing and the breast milk will disappear rapidly because of insufficient stimulation; also the substitution of a bottle for a breast feeding should be prohibited in early cases of deficient lactation because the periods between breast stimulation are too long and the breast always fails. The feedings must be weighed from day to day since the amount of breast secretion may be very variable. As the quantity of breast milk is increased, the supplementary feeding is reduced. If the child shows an average increase of more than one ounce daily, even though the weighing of the feedings may not demonstrate an increase in lactation, the supplementary feedings are reduced so that the increase in body weight does not exceed this amount.

It may be said that the usual baby scales or kitchen spring scales are entirely useless in the accurate management of such a case. An accurate beam scales weighing at least to ½ ounce is indispensable.

When the child has nursed, the breast is pumped or milked manually to empty it. In no case is pumping allowed for longer than 10 or 15 minutes, because the breast is practically empty after this effort, and prolonged efforts make the patient tired and nervous.

Of chief importance in the stimulation of lactation, I have found passive hyperæmia of the breasts by means of a Bier pump. During my services in the Frauenkliniks in Heidelberg and

[1] Surg. Gynec. & Obst., 1913, xvii, 103.

Vienna, I became interested in Jaschke's work along this line, and during the six years since, I have had abundant opportunity to demonstrate the efficiency of this method of treatment.

A sufficiently large bell is selected so that it allows plenty of room for complete engorgement of the breast. After the breast has been nursed and pumped, the hyperæmia bell is applied four times each day. A coating of vaseline is put around the edge of the glass where it touches the skin, the bell is adapted to the breast and the air exhausted until the resulting engorgement becomes distinctly uncomfortable at which tension it is kept for 15 minutes each time. The tension should not be great enough to produce pain, or hæmorrhage into the tissues occurs, and the breast is harmed. When the tension is right, the breast is usually slightly cyanotic and milk begins to escape from the nipple. Not only is this of benefit in supplying hyperæmia with resulting increased secretion, but the tension may cause plugs to escape from the milk ducts and produce an easier flow of milk. The patient soon learns how to manage this detail in her treatment without supervision.

I have repeatedly had patients in whom the amount of milk obtained was only one quarter to one ounce at a feeding on the seventh to tenth day of the puerperium, and, by using the means outlined above, it has been possible to discontinue supplementary feeding in a week to ten days, with the result that the mother furnished sufficient milk and continued to nurse the child unaided for nine months or more.

SMALL DOSES OF PITUITRIN IN OBSTETRICS[1]

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IN pituitrin we have an oxytocic that is safe when used rightly, generally prompt in action, and one that may be given during any stage of normal labor.

In this paper I shall not attempt to review the literature or to discuss the physiological properties of pituitrin, but shall give you a résumé of my experience with this drug in one hundred and fifty cases. The drug was given undiluted and intramuscularly. It was found that injections into the biceps gave promptest, most uniform, and best results. Increased uterine contraction and pains began almost immediately in some cases. Twelve minutes was the longest time I ever had to wait for a definite reaction. In only one case did pituitrin fail to work. The patient was a primipara, twenty-eight years old. The pelvis was slightly contracted. She had been in labor for thirty-six hours. The cervix was three-fourths dilated when the pains stopped. She was given two doses of 1 ccm. each of pituitrin from a one-ounce-bulk bottle, at half-hour intervals, without any results. After allowing her to rest for several hours she finally delivered herself. A specimen of the pituitrin used in this case was found by laboratory tests to be practically inert. Since then I have been using the 1 ccm. vials with uniformly good results.

Previous to January 1, 1912, I had been using pituitrin in 1 ccm. doses, but the severe reaction characterized by the excessive, continuous, almost tetanic-like bearing-down labor pains, the loss of control over the mother, her intense suffering, the dangers to herself and the child, as the following three cases will illustrate, induced me to try smaller doses.

Case 1. Mrs. W., III-para, a well-built woman with a large pelvis. The perineum was badly lacerated from her previous confinements and she also had a prominent goiter which, however, caused her very little inconvenience. The cervix was almost dilated and the pains were irregular and weak. The fœtal head was high up in the pelvis in the L. O. A. position. One cubic centimeter of pituitrin induced severe labor pains within a few minutes, and a ten-pound child was precipitated through the vulva. The infant's head was not molded, there was a profuse sero-sanguineous discharge from the nose, and the child died six hours later, probably from a fracture at the base of the skull.

Case 2. Mrs. N., a II-para, whose previous confinements were both normal. Examination showed about the same conditions as in the above case. Five minutes after the injection she gave birth to a seven-and-a-half-pound cyanotic child which died in convulsions ten hours later.

Case 3. Mrs. C., a II-para, both of whose children were born without any difficulty, although the labors were somewhat prolonged. When the cervix was almost completely dilated, 1 ccm. of pituitrin was injected. Severe pains started within a few minutes, and forced a seven-pound infant through the perineum, causing a very bad laceration.

Since the above unfortunate results, I have used the two- or three-minim doses of pituitrin

[1] Read before the Cleveland Academy of Medicine, January 15, 1915.

in various stages of labor with perfect results. Twenty-nine primiparæ and sixty-seven multiparæ required each only one injection. The infants varied in weight from four to twelve pounds.

The following three cases will illustrate the use of the drug at different stages of normal labor:

CASE 1. Mrs. R., age 19, primipara; the pelvis was normal and the fœtal head in the L. O. A. position. The patient had been having vague, irregular pains every ten to fifteen minutes for twelve hours with no apparent result when she arrived at the East Fifty-Fifth Street Hospital. Three minutes after the injection of two minims of pituitrin, definite, firm, regular labor pains began. The cervix was completely dilated within two and a half hours, and a seven-pound child was born two hours later.

CASE 2. Mrs. S., age 35, III-para; she entered Maternity Hospital at 7 p.m., having irregular weak pains, which stopped completely about midnight. On examination at 10 o'clock the following morning the cervix admitted two fingers. Five minutes after the injection of four minims of pituitrin, strong, regular bearing-down pains began and she gave birth to a seven-and-one-half-pound babe fifty minutes later. There were no lacerations of any of the maternal parts.

CASE 3. Mrs. M., primipara; examination at St. Ann's Hospital showed a normal pelvis, cervix completely dilated, the membranes ruptured, the fœtal head in the first position and resting on the perineum. The patient felt very tired and could not make use of the weak labor pains that occurred every three minutes. Almost immediately after the injection of two minims of pituitrin, good strong pains began, the mother gained strength, and ten minutes later an eight-and-a-half-pound infant was born.

In thirteen cases, five of which were primiparæ, two to four doses were given at intervals of one-half to three-quarters of an hour with very satisfactory results. One of these cases was a V-para, a very frail woman with a stretched-out, weakened abdominal wall. She gave birth to an eleven-and-a-half-pound child six hours after the beginning of labor. Without the use of pituitrin she would either have suffered for many hours longer or a forceps delivery would have been necessary.

Another woman, a VI-para, was tubercular, very weak, and unable to help herself. She required four injections during labor. She went through her confinement very nicely and six months later did not seem any the worse for her experience. Many of these cases were normal deliveries, but slow and tiresome. Several injections at varying intervals certainly helped to shorten the mental and physical sufferings of these patients.

In twenty-six cases, sixteen primiparæ and ten multiparæ, medium or low forceps were used to help terminate labor. The small doses of pituitrin had caused good strong uterine contractions, but owing to the following conditions the deliveries had to be assisted. Twelve women had various degrees of contracted pelves, and four had large pendulous abdomen and could not bear down during the pains. In four cases the fœtal heads were in the R. O. P. position and would not rotate. In four others the fœtal heads would not mold, while in the remaining two cases the children were very large. Six of the multiparæ had been delivered with forceps in previous confinements. Four women who had in their previous confinements been delivered with the aid of forceps were able to give birth in their last labors with the assistance of pituitrin only.

So far, I have limited my paper to normal or nearly normal obstetrical cases. In the following I shall try to illustrate the use of pituitrin in abnormal cases. In this group there are two breech cases, two sets of twins, two cases of premature labor, one case each of bronchitis and asthma, two instances of dry birth, and one of induced labor.

The following clearly demonstrates the value of pituitrin fn breech cases:

Mrs. S., age 30, married 13 years, VIII-para; a frail little woman, very anæmic and weak. Her previous confinements were all normal. At the end of twelve hours of regular labor pains, the cervix was completely dilated, the membranes were ruptured, and the breech was resting on the perineum. The patient was very tired. The labor pains ceased and she was unable to expel the child. Two minutes after an injection of two minims of pituitrin, strong bearing-down pains began and continued until the child was born, five minutes later.

The other breech case was almost identical with the above.

Labor in twin cases as a rule is slow, tedious, and exhausting. The pains are generally indefinite and diffuse. The following two cases will show the marked benefit of small doses of pituitrin:

CASE 1. Mrs. M., primipara, in labor thirty-six hours. The pains were variable and caused very little results. A diagnosis of twin pregnancy was made. When the cervix was two-thirds dilated, two minims of pituitrin were given. Good strong bearing-down pains immediately began and a five-pound child was born fifteen minutes later. The uterine contractions did not abate and, after rupturing the second membranes, another infant, weighing five and a half pounds, was delivered within five minutes.

CASE 2. Mrs. J., primipara. After the birth of the first child, which weighed six pounds, labor pains ceased and the uterus began to relax. Three minims of pituitrin immediately started strong labor pains, and within a few minutes the second child was born.

In two cases of premature labor at six and a half and seven and a half months respectively, and two cases of dead macerated full-term pregnancies about the size of six-month fœtuses, the

cervices were about two-thirds dilated, but the pains were slow and weak. Injections of two minims of pituitrin in each case caused prompt response, and the termination of the labors varied from ten minutes to half an hour.

The following two cases are very interesting:

CASE 1. Mrs. R., age 36, V-para. All were easy confinements, but during the last two months she suffered from a severe bronchitis. Drugs had very little effect on it. The coughing spells at times were so severe that often she became livid and almost choked. When labor pains began she was very weak and emaciated. Every time she tried to bear down, the coughing would prevent her from doing much. Four minims of pituitrin were given after the cervix was two-thirds dilated. Good strong labor pains began within a few minutes, and a seven-pound babe was born twenty minutes later. After the confinement the bronchitis was easily cured.

CASE 2. Mrs. F., age 22, a III-para, suffered from severe bronchitis and asthma which increased as the pregnancy advanced. When the cervix was partly dilated, three minims of pituitrin produced the same striking results as in the above case.

Few conditions in obstetrics are more dreaded by the obstetrician, and harder or more exhausting to the patient, than dry birth. Labor is greatly delayed, the suffering to the woman is more intense, and the dangers to the child are increased. With the aid of small doses of pituitrin much can be done in these conditions as the following cases will show.

CASE 1. Mrs. G., age 42, IV-para; youngest child twelve years old. While getting off a street car at 10 p.m., the membranes ruptured. Slight, indefinite labor pains began about one hour later. At 12:15 a.m., the cervix barely admitted two fingers. The fœtal head was in the third position and the pains were irregular, occurring every ten to fifteen minutes. Within ten minutes after the injection of two minims of pituitrin, strong, regular pains began at two-minute intervals. At 5 a.m. a seven-pound-ten-ounce child was delivered with low forceps, the head failing to rotate into the anterior position.

CASE 2. Mrs. C., age 19, primipara, a small woman whose pelvic measurements showed a slight general contraction. The membranes ruptured suddenly without pains about 10 p.m. Examination showed no dilatation of the cervix, and the head was unengaged. About one hour after arriving at the hospital irregular ten- to fifteen-minute vague labor pains began. Ten minutes after the injection of two minims of pituitrin, definite, regular, two- to three-minute bearing-down pains began and lasted about an hour and a half. The cervix now admitted two fingers. Under anæsthesia, a medium-sized Barnes bag was inserted and filled with sterile water. At 2 a.m. her pains were again weak, and two minims of pituitrin were again given. At 5 a.m. the bag was expelled. The pains then stopped, but began soon after a third injection, and a normal, healthy, six-and-three-fourths-pound babe was born at 7:30 a.m., nine and a half hours after the rupture of the membranes.

The last case which I will report in this paper shows the danger pituitrin may cause when there is a malposition of the child.

Mrs. P., age 32, a II-para, whose youngest child was eight years old. Both were normal deliveries. Two years before, she had had an attack of pulmonary tuberculosis from which she recovered in about six months. Shortly after returning from the sanitarium an exploratory laparotomy on account of severe, indefinite abdominal pains was performed by one of our leading surgeons. The incision extended from the tenth costal cartilage to Poupart's ligament. No gross pathological lesion was found and the patient made an uneventful recovery. Six months later she became pregnant. During the seventh month the lower part of the scar opened. She was kept in bed during the next six weeks; but instead of healing, the scar gradually opened more and more. It was then decided to induce labor with bougies. Two were inserted and the vagina packed at 10 a.m. Labor pains began late in the afternoon. They were infrequent, irregular, and exhausting to the patient, continuing for thirty-two hours. Two minims of pituitrin were given at 7 p.m. Good, regular bearing-down pains began within a few minutes, causing the patient much suffering and a marked tension on the abdominal scar. She was placed on the operating table, and under light anæsthesia the vaginal packing and the bougies were removed. The cervix was about two-thirds dilated, but the head was not engaged. The severe pressure of the head against the brim of the pelvis, narrowed by the bougies, forced the head up and the shoulders down. While dilating the cervix bimanually, the membranes ruptured and the cord prolapsed. While I was doing a version, the uterine contracting ring became so firm that it was almost impossible for me to remove my hand. Under deep anæsthesia, the fœtus was with difficulty turned and delivered up to the umbilicus. The ring had contracted around the child's neck and it took considerable time to deliver the suffocated body.

The following are some observations not mentioned in the text of this paper, but which I have also noted in the foregoing cases: (1) No infection of the arm followed the injection of pituitrin. (2) One cubic centimeter ampule was often used for three or four cases. (3) Some patients, when questioned, complained of stronger after-pains following the injection of pituitrin than in their previous confinements. A word of warning, however, will not be amiss: the uterus should be watched, for, following the relaxation of a strongly contracted uterus, there is danger of post-partum hæmorrhage. (4) The patient should not be left alone after an injection, for labor may progress much faster than examination might indicate.

CONCLUSIONS

1. Pituitrin is an ideal oxytocic, in that it is safe when properly used.
2. It may be given in any stage of normal labor.
3. Intramuscular injections into the biceps give the most prompt and best results.
4. Some definite and immediate change in the labor pains after an injection of a small dose of pituitrin from the sealed ampules nearly always occurred.

5. Pituitrin will help to differentiate true from false labor pains, but will not induce pains.

6. Small doses influence the pains and can do very little harm, but with large doses the uterine contractions are beyond control.

7. The infant mortality and the morbidity of the mothers are much greater when big doses of pituitrin are given.

8. In normal labor, small doses of pituitrin will shorten the time of labor from two to twelve or more hours.

9. Occasionally, several small doses at intervals may be necessary to get the desired results.

10. Pituitrin does not take the place of forceps, but if properly used makes a forceps case easier.

11. The drug acted satisfactorily in breech presentations, and also in twin and dry-labor cases.

A NEW TONSIL-HOLDING FORCEPS

By STEPHEN C. GLIDDEN, M.D., Danville, Illinois

THE forceps are made on the same principle as are the alligator-jaw ear forceps. The holding teeth are made similar to those in a vulsellum forceps. The opening between the teeth is 1⅛ inches allowing the tonsil to be firmly grasped either longitudinally or crosswise. Because of the acute angle the handle can be used on either side of the throat without being in the operator's way. The lock is placed at the end of the handle and is made small enough to allow a snare to be slipped over the instrument without removing it after it is placed on the tonsil.

The advantages are: The forceps are compact, they are easy to handle and have a firm gripping power without obstructing the operator's field of vision.

CORRESPONDENCE

RÖNTGEN ILLUSTRATIONS

Dr. Edward H. Skinner of Kansas City, Missouri, has submitted to us the following suggestions concerning making X-ray reproductions uniform:

"There is not sufficient uniformity in the illustrations of röntgen articles. One notices so many reproductions of chest and abdominal negatives which force one to imagine that he is looking through the body in the postero-anterior position. It would be much better to standardize these cuts so that all of them will appear to the reader as antero-posterior views. This is the usual way physicians have of examining a patient.

"There need be no difficulty in securing half-tones which will always appear this way because any reproduction can be reversed, if necessary, in the lithographic process.

"If the editors of journals would insist upon this, one would not be required to look upon a reproduction of a bismuth-filled stomach as if he were looking through the patient's back. It is not always possible to furnish the lithographer with a print which gives the correct prospective but the lithographer can easily reverse the print, if necessary, so that the reader will always observe the patient antero-posteriorly.

"One may also obtain increased sharpness in the röntgen illustrations by a series of reductions in the size of the lithographic cut. For instance a 14 x 17 negative of the bismuth-filled gastro-intestinal tract can be reduced to an 8 x 10 size, and this to a 4 x 5 size. Each reduction adds sharpness to the outlines."

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JUNE 18, 1915, WITH THE PRESIDENT, DR. ROBERT T. GILLMORE, IN THE CHAIR

DR. RUDOLPH W. HOLMES read a paper entitled "Obstetrics, a Lost Art; A Criticism against the Promiscuous Indications for Cæsarean Section." (See p. 636.)

DISCUSSION

DR. HENRY F. LEWIS: Inasmuch as Dr. Holmes distrusts the section scar as a source of weakness and consequent danger to the patient in the event of a second pregnancy, would he advise sterilization at the time of the cæsarean section to do away with this danger? I quite agree with him that no one can be assured of the strength of his section scar in the uterus, no matter if he personally has made it and has used the greatest care in the closing of it. Every scar, no matter where it is located, is connective tissue, and no one can guarantee that a scar will not rupture.

DR. CHAS. S. BACON: I consider that Dr. Holmes' paper is a very timely and important one. The necessity of subsequent cæsarean sections in the event of subsequent pregnancies is an important element of consideration when weighing the indications for a cæsarean section in such diseases as eclampsia, for instance. I do not believe, however, that I would sterilize a young primipara, but believe that in subsequent labors it should be seriously weighed. When desired by the patient, though in particular cases I urge against it, I never have refused to follow the desires of the patient. In placenta prævia, age, general health, and many other factors must be weighed in arriving at a decision; for instance, a central placenta prævia in a primipara of 35 might lead to a cæsarean section, when in a young woman it would not. I cannot agree with Dr. Holmes that a rigid cervix cannot exist with placenta prævia. I have one case particularly in mind where this combination existed and where a section probably would have saved both mother and child but where a delivery through the natural passages caused the death of both. However, I believe as does Dr. Holmes that to advise cæsarean section for placenta prævia under all conditions is very questionable obstetrics.

DR. MARK J. GOLDSTINE: What is Dr. Holmes' attitude toward the multipara with a minor contraction who has a typical history of increasing difficulty at each subsequent labor because of the natural increased weight of subsequent children and gradually waning powers of the uterine muscle? Would he prefer to do a section and sterilize her provided she has several children alive or would he subject her to a difficult high forceps or other operation through the natural passages?

Dr. Holmes calls attention to the factors influencing the diagnosis of placenta prævia totalis. Every placenta prævia is complete at first; one feels the placenta on all sides with one finger dilatation. With advanced dilatation, however, the diagnosis may have to be changed, since the membranes may then be palpated and the placenta is marginal at this stage.

DR. W. A. N. DORLAND: I think the operative furor for cæsarean section at the present time is comparable to the operative furor seen in pelvic surgery some fifteen to twenty years ago when ovaries were removed on all sorts of indications. I confidently believe that in the future the present furor will be held just as responsible for harm as we now look upon the interfering and meddlesome gynecology of years ago. The man who does a section because there is a fibroid in the fundus or anterior wall of the uterus, and because of this only, is maltreating his patient, while if a fibroid is obstructing the outlet it is just as urgent an indication as is a bony obstruction to the natural birth. In considering the merits of cæsarean section in eclampsia one great item is the larger number of infants saved than by other methods.

DR. CAREY CULBERTSON: It cannot be gainsaid that too many cæsarean sections are done. That a woman who has had a cæsarean section subsequently is delivered by natural passages is no proof of the lasting strength of her uterine scar. In one case I attended, the cæsarean section had been performed by one of our greatest experts and the patient was subsequently safely delivered by low forceps, but in her third labor she was brought to the maternity in a moribund state with a ruptured uterus.

DR. JOSEPH BAER: At the Michael Reese Hospital we are as strict in the indications for cæsarean section as is Dr. Holmes, as can be seen from his paper. On a charity service that averages one thousand cases a year I do not remember that we have ever had a cæsarean section, pelvic indications being absent among the women coming to us. During the last winter we had seventeen cases of eclampsia —all were treated according to Stroganoff with subsequent delivery through the natural channel.

All the mothers recovered and thirteen living babies were delivered.

DR. EMIL RIES: I commend the stand of Dr. Holmes against the loose indications for cæsarean section and believe that Dr. Holmes' paper should be given for publication to a journal reaching general practitioners. He tells of an instance where a physician performed a cæsarean section upon the mother of a family of four children because she was one week over the date of her expected confinement, and for no other reason, and the woman died of the operation. Such a medical tragedy is terrible and such a physician should in some way pay the penalty of his misdeed.

I am interested in Dr. Holmes' reference to the value of rectal examination. I do not know that this is recommended in any textbook, and I have read no magazine articles in which this safe means of diagnosis was advocated. Twenty-three years ago I first advised rectal examination. As a new departure it received a great deal of criticism as all new methods do. I should like to know for my personal satisfaction how extensive the practice of rectal examination is, and how many members of this society are acquainted with it.

DR. N. SPROAT HEANEY: Five years ago I know that several members of this society who now are strong advocates of rectal examination were unacquainted with its virtues. I teach the students and my internes this valuable diagnostic aid. Only operative cases at the Presbyterian Hospital are examined vaginally; cases that confine normally rarely receive a vaginal examination during labor.

How many members of this society are frequently called to see cases presenting abnormalities during labor? Not many. The general practitioner does not see difficulties in time to call counsel, or if he does he considers himself all sufficient to overcome the difficulties. The surgeons raise a hue and cry against the prevalence of bad surgery, but bad surgery is nothing compared to the rotten state of obstetrical practice. My chief objection to cæsarean section is that it is spectacular and easy; these two factors are the direct cause of so many contraindicated cæsarean sections. It would be a much better thing for American women in general if the operation were not so simple and carried with it a much higher immediate mortality.

DR. WILLIAM HEWITT: Would Dr. Holmes do a cæsarean section on a woman because of coexistent pyelitis and rectal fistula? What would Dr. Holmes' attitude, relative to cæsarean section, be in the case of a primipara with a heart lesion?

DR. HOLMES (closing): The dictum "once a cæsarean always a cæsarean" is a dictum which is being more and more widely adopted. Dr. Webster in a former meeting denied this dictum but has subsequently changed his opinion. How the wound is sewn I believe is important and decreases the risk, but, nevertheless, none can estimate the staying powers of catgut or the phagocytic activity of the uterine wall. Each case is to be regarded as liable to rupture and should not be subjected to labor. In the first section I do not take up the question of sterilizing; if suggested by the patient it may be performed if apparently justified by a full consideration of the circumstances. In the second or subsequent section, I explain the operation of sterilizing to the patient, if she has a living child already, and allow the patient to decide this point herself. In other words, I would much rather in the first labor take much greater chances with that child in the interests of her potential capacity as a mother of several children. The age of the patient alone should never be the sole indication for cæsarean section, for the soft parts do not as frequently as thought cause increased difficulty with age. The chances of a primipara at 40 having a rigid cervix or faulty uterine muscle through acquired disease, as inflammation and tumor, is of course greater, but age alone is a factor of no consideration. The case of Dr. Goldstine's is a fit subject for cæsarean section with excision of the uterine ends of the tubes.

I see no reason for doing a section on a woman with a pyelitis or with a rectal fistula either alone or together. The possibility of the infection spreading up the birth canal is just as great where the child has been removed by cæsarean section, and once in the uterus the sectioned uterus is much less resistant than if it had no wound in it. This is a typical example of faulty knowledge of pathology in establishing the indication for section. I believe that a woman with valvular heart lesion should not marry or get pregnant, but when pregnant our stand should rest upon the character of the heart lesion. I have repeatedly seen women go unscathed through pregnancy and labor and the puerperium with marked anatomical valvular heart lesions. The fact that a valvular heart lesion exists never brings a cæsarean into consideration. If the woman has had at some time a broken compensation, no matter if apparently recovered, or if she has a myocarditis and especially if she has at present suggestive condition of broken compensation, that patient cannot stand the stress of an average labor and the question of a cæsarean section and sterilization may well be taken under advisement as the possibility of least harm. Rectal examination is of the greatest help in labor, and I have taught my students it for years. It is of great benefit in complicated cases, because if the case becomes operative the woman is not already infected by frequent vaginal examinations.

THE MANAGEMENT OF DEFICIENT LACTATION

Dr. N. Sproat Heaney read a paper entitled "Management of Deficient Lactation." See p. 657.

DISCUSSION

DR. BACON: This is a subject that has interested me for years and it is enjoyable to know that others are making especial efforts in this line. The attention to the breasts is left too much solely to the ingenuity of the nurse, who receives no instruction

in this important part of obstetrics. The physician has to supervise the attention of the babe if he expects to have lactation persist in a high percentage of cases. The effect of the psychic influence cannot be overestimated in its effect on milk secretion. Painful fissures in nipples may retard lactation, and thus deserve particular attention. When one breast does not yield enough, both breasts may, so that a child may begin to gain if it is given both breasts each nursing: the first one for 15 minutes, the second for five minutes. Of course, I believe in more frequent feedings than six times daily. Frequently the breasts may be much more completely emptied and therefore stimulated if milked by hand than if pumped. The child should be made to gain by being given supplementary feedings and as Dr. Heaney says its improved condition will help it more thoroughly to stimulate its mother's breast. Substitute feedings should never be employed, as the breast is thereby rested for too long intervals.

DR. DANFORTH: I have used hyperæmia in many cases and am positive of its beneficial effects. Its use should be instituted early if the most benefit is to be obtained.

DR. A. BELCHAM KEYES: Of great importance in preparing a mother for the capacity of nursing is the preparation of the nipples. She should for weeks preceding delivery pull and massage the nipples so as to make them more readily grasped by the infant.

DR. HEANEY (closing): Much information of value in the understanding of human lactation can be gained by studying the feeding and general management of lactation in scientific dairy establishments. Beyond an abundantly rich mixed diet there is nothing in the selection of food to influence certain constituents of the milk. Each individual has personal peculiarities regarding the constituents of her own milk, which vary but slightly throughout an entire lactation. The end milk obtained is much richer in fat than the first, and for this reason it may occasionally be better to put a child on each breast for a short period when a weaker milk is wanted, for reasons aside from quantity. With a normal child, however, the great factor is never quality but quantity that is at fault; either the child doesn't get enough or it gets too much, and the infant's troubles are originally due to this variation. I am certain that if you use hyperæmia as a means of stimulating deficient lactation, you will be just as ardent in its use as are others of my friends who have taken it up.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

THE TREATMENT OF FRACTURES. By Charles Locke Scudder, M.D. Eighth Edition. Philadelphia and London: W. B. Saunders Company, 1915.

MODERN ASPECTS OF THE CIRCULATION IN HEALTH AND DISEASE. By Carl J. Wiggers M.D. Philadelphia and New York: Lea & Febiger, 1915.

APPLIED IMMUNOLOGY. The practical application of sera and bacterins prophylactically, diagnostically, and therapeutically. By B. A. Thomas, A.M., M.D., and R. H. Ivy, M.D., D.D.S. Philadelphia and London: J. B. Lippincott Company, 1915.

SIMPLIFIED INFANT FEEDING. With seventy-five illustrative cases. By Roger H. Dennett, B.S., M.D. Philadelphia and London: J. B. Lippincott Co., 1915.

THE CLINICS OF JOHN B. MURPHY, M.D., AT MERCY HOSPITAL, CHICAGO. Vol. IV, No. 3. Philadelphia and London: W. B. Saunders Company, 1915.

BEAUTY AND MOTHERHOOD. By Ferdinand Herb, M.D. Chicago: The Medico Press, 1915.

THE MEDICAL CLINICS OF CHICAGO. Vol. I, No. 1. Philadelphia and London: W. B. Saunders Co., 1915.

TWILIGHT SLEEP. AMNESIA AND ANALGESIA IN PARTURITION. By Alfred M. Hellman, B.A., M.D., F.A.C.S. New York: Paul B. Hoeber, 1915.

TEXTBOOK OF SURGERY. For students and practitioners. By George Emerson Brewer, A.M., M.D. Philadelphia and New York: Lea & Febiger, 1915.

POTTER'S COMPEND OF HUMAN ANATOMY. Revised by D. Gregg Metheny, M.D., L.R.C.P. and S., L.F.P.S. Eighth edition. Philadelphia: P. Blakiston's Son & Co., 1915.

TWELVE LECTURES ON THE MODERN TREATMENT OF GONORRHŒA IN THE MALE. By Dr. P. Asch (Strassburg). Translated and Annotated by Paxton E. Gardner, M.D. New York: Rebman Company, 1915.

A TEXTBOOK OF CHEMISTRY AND CHEMICAL URANALYSIS FOR NURSES. By Harold L. Amoss, M.D. Philadelphia and New York: Lea & Febiger, 1915.

CANCER: ITS STUDY AND PREVENTION. By Howard Canning Taylor, M.D. Philadelphia and New York: Lea & Febiger, 1915.

CASE HISTORIES IN DISEASES OF WOMEN INCLUDING ABNORMALITIES OF PREGNANCY, LABOR, AND PUERPERIUM. A clinical study of pathological conditions characteristic of the five periods of woman's life. By Charles M. Green, A.B., M.D. Boston: W. M. Leonard, 1915.

THE PRACTICAL MEDICINE SERIES, VOL. IV, GYNECOLOGY. Edited by Emilius C. Dudley, A.M., M.D., and Herbert M. Stowe, M.D. Chicago: The Year Book Publishers, 1915.

A MANUAL OF GYNÆCOLOGY. For students and practitioners. By Samuel J. Cameron. London: Edward Arnold; New York: Longmans, Green & Co., 1915.

THE PRINCIPLES AND PRACTICE OF OBSTETRICS. By Joseph B. De Lee, A.M., M.D. Second edition thoroughly revised. Philadelphia and London: W. B. Saunders Co., 1915.

COLLECTED PAPERS FROM THE RESEARCH LABORATORY OF PARKE, DAVIS & CO., Detroit, 1915.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

By MAJOR G. SEELIG, M.D., St. Louis, Missouri

WE have commented before, in this department, on the unusual interest connected with tracing tendencies in current medical literature. Those with eyes open for such things must have noted the recent strong current of comment on the proper use of English, as a means of conveying purely medical thought. From widely separated quarters the slogan of "Better English" has been bugled—Philadelphia, New York, and Rochester. And 'tis well 'tis so, for if operative procedures on patients were as disastrous as are the mutilating attacks of medical authors upon the English language, our operating rooms would have to be cordoned with police. One must not draw the inference that the sins of faulty composition are limited to medical literature. Only recently, Walter Lippmann, in commenting in *The New Republic* on a certain unnamed political writer, said that he must have been toothless, judging from the difficulty one experienced in understanding him. Our interest centers, however, as a matter of course, in purely medical composition.

Personally, I believe that the sole value of a campaign for better English lies in shaming men into providing suitably decent clothes for their thoughts. I doubt very much whether men who have graduated in medicine can, at that late day, be taught to use their mother tongue properly, to say nothing of forcefully and clearly. Good English is largely a question of mother's milk; and lactation is rarely prolonged beyond undergraduate days. But what men can be taught is that the ordinary amenities demand as tactful a concealment of poverty of verbiage and thought as is ordinarily practiced to conceal the lack of more material things. There is always a good-natured critic at hand to whip a reasonable amount of correctness, clearness, and conclusiveness into almost any worthy medical exposition. And that is what is meant by "shamed into providing suitably decent clothes"—suitable clothes, willy-nilly; if not of your own selection, then of the selection of a more tasteful dresser of thoughts.

Of course, no one could successfully maintain the thesis that any age is too late to study, profitably, English, or any other subject. The fact remains, however, that the average man who writes poorly at the age of thirty, can correct his diction with difficulty so nearly insuperable, that the task becomes an impossible one. McCrae's plea for a more accurate use of words is timely (*Journal American Medical Association*, July 10, 1915); but the incorrect use of words is only one difficulty, and not the greatest, by any manner or means. Many men who use their words with scientific precision succeed in putting them together so that the intended thought is merely a mess of scrambled cerebration. Most medical writing is expository; clearness is the first essential of good exposition, and in order to obtain clearness it is necessary not only to use words properly, but also to group them properly as sentences, to coördinate sentences properly as paragraphs, and to arrange paragraphs into a unified whole. A German once said that by a sort of gravity, our thoughts fell easily onto paper, and against that same gravity, rose with difficulty from the paper to the mind of the reader. Pity 'tis, 'tis true.

This first book for review,[1] illustrates rather concretely some of the thoughts expressed above. Although essentially a surgical product, the volume deals so largely with the purely medical phase of the problem discussed that I have asked for medical consultation with Dr. Sale, who responded graciously with the following criticism: The presidential address before the section on internal medicine, which met recently in San Francisco, sounded a timely warning. That the leaders in American medicine should start propaganda for greater accuracy in the choice and use of words is most desirable. We cannot all write like William Osler, Clifford Albutt, Lauder Brunton, or Arbuthnot Lane, but we can avoid gross errors. This, the author of the book under discussion, has failed to do. As a literary production the book is a sad example. The volume is, indeed, rather remarkable in that almost on every page we find an unfortunate phrase, a grammatical error, or a syntactic sin.

Let us quote at random. On page 18 the author writes, "prolonged diarrhœa, through loss of sleep, drain upon the system, worry, digestive disturbances, and auto-intoxication (which frequently accompanies it and tends to the production of other circulatory defects) lowers the vitality and bodily resistance, and altogether makes the patient an easy prey to microbes, and is often the direct source of pathologic changes within the gut, in

[1] Diarrhœal, Inflammatory, Obstructive and Parasitic Diseases of the Gastro-Intestinal Tract. By Samuel Goodwin Gant, M.D., LL.D. Philadelphia and London: W. B. Saunders Company, 1915.

close proximity to it, and in distant parts, because the irritating fluid discharges serve to erode or break the continuity of the intestinal mucosa, permit specific and non-specific bacteria to enter the circulation and be carried to remote parts, where they may cause trouble, or penetrate deeply into or through the intestinal wall with the resultant production of deep-seated mixed infection, ulcers, abscesses, fistulæ, pyæmia, peritonitis, septic pneumonia, or other serious complications." Shades of Beowulf, Chaucer, Shakespeare, Addison, Steele, and Macauley!

On page 321 we read that "one might as well attempt to get up a single definition which would define scarlet fever, whooping-cough, chicken pox, etc., as to seek to accomplish the same for dysentery because of its variegated [sic!] etiology, changeable [sic] intestinal pathology, and the dissimilar manifestations in the different forms of the disease." If the publishers would authorize the change, we should amend this paragraph to make it read about as follows: "One might as well attempt to define scarlet fever or whooping-cough as to define dysentery with its complex etiology, its diverse intestinal lesions, and its varied manifestations."

On page 407 we are informed that, "in some instances patients are desperately ill throughout the attack (bacillary colitis), the accompanying symptoms are out of all proportion to the intestinal lesions, and they may be difficult or impossible to discover." The reader must surely have grave doubt whether the patients, or the symptoms, or the lesions are so difficult of discovery.

On page 519 the author takes a strangle hold on the English language as follows: "Recent accumulations of the above types may induce diarrhœa through obstructing the gut, as would a cancer or other tumor, direct irritation to the bowel, by setting up a localized catarrh favoring the retention of putrefying material and the multiplication of the normal intestinal pathogenic bacteria and their toxins, which lead to increased peristalsis, glandular secretion, and diarrhœa, owing to their influence upon the local and general mechanism." After the reader, like a modern Theseus, has tried to find his way through this labyrinth, is he not justified in crying aloud, "Light, more light"?

As comment on the foregoing it may be urged that the author did not purpose to write a treatise on English and that the reviewer should confine his criticism to the matter of the book. Dr. Gant exhibits an intimate acquaintance with his subject matter and a command of the literature. The book represents a tremendous amount of work and the reader gains the impression that the author is probably a clever teacher and an interesting clinician, even though this particular book is of doubtful value.

The book is too voluminous, owing partly to an unhappy padding, but even more to the inclusion of discussions that do not seem to be in place in a book with this title. Measles, scarlet fever, varicella, whooping-cough, alcoholism, methemoglobinæmia, etc., are not diseases of the gastro-intestinal tract. The diarrhœa that occurs in these conditions is purely symptomatic and should be discussed in a textbook on general medicine, or in special treatises.

The author valiantly champions surgical intervention in very many conditions. His enthusiasm often carries him too far. A work such as this is bound to result in much needless and often pernicious surgery. A whole chapter is devoted to the surgical treatment of tuberculosis of the intestines. The author recommends, among other things, entero-anastomosis "when there is extensive lung involvement and the patient is greatly debilitated and exhausted." This is indeed radical counsel. To us it seems that ileocæcal tuberculosis, rectal tuberculosis, and strictures resulting from healed ulcers are the only safe and sane indications for operative measures.

In view of the fact that the author discusses diarrhœa in relation to many conditions that are not gastro-intestinal, it is surprising that he devotes so little space to intestinal neoplasms. The subject affords a real opportunity to the expert gastro-enterologist to do some educational work and to make much needed propaganda. There are several tables for differential diagnosis. These are as useless and misleading as such outlines are bound to be. They have, all of them, an inherent weakness in that they ignore the fact that we cannot, except perhaps in exceptional instances, carry out a plan of terse, antithetical characterization of two conditions that have much in common.

One of the main functions of the reviewer should be to assist others in making a choice of books that they would give permanent place on their shelves. For student or practitioner whose means are limited, a discriminating selection is essential and not always easy. To such a one we express reasonable doubt as to whether this book will enhance the real value of his collection.

BY fortuitous circumstance the volume of *Collected Papers of the Mayo Clinic*[1] bears on our *leit-motif* of English composition, for Mrs. Mellish contributes to this collection "Suggestions for Writers of Medical Papers." This little essay is admirably done; so admirably, indeed, that we suspect that Mrs. Mellish must be an inestimably valuable factor in toning down and trimming up much of the Mayo Clinic printed product. The essay in its entirety could be well paraphrased as "keep your eye on the ball." And that's why we doubt the resultant value of such advice as Mrs. Mellish furnishes. It is very well and very necessary to counsel steadiness of gaze, but it is an entirely different story to attain such a consummation. If any proof were necessary to clinch our seeming

[1] COLLECTED PAPERS OF THE MAYO CLINIC, ROCHESTER, MINNESOTA, 1914. Edited by Mrs. M. H. Mellish. Vol. VI. Philadelphia and London: W. B. Saunders Company, 1915.

pessimism, we could find it close at hand. The following sentence is copied from a paper, published from the Mayo Clinic in one of our weekly journals, within the month (July). "We believe, now, however, that in the patient who is quite relieved by gastro-enterostomy for a period, usually under a year, and then develops symptoms similar to those produced by the original lesion, such symptoms being persistent and unrelieved by any medication, that a second ulcer has occurred in the region of the anastomosis must be considered a strong possibility."

But laying aside all thought of mother tongue, one is forced to assume an attitude of admiration for this most excellent collection of work. There are approximately eighty papers by thirty-odd authors. The contributions are grouped under the heads of Alimentary Canal, Urogenital Organs, Ductless Glands, Head, Trunk and Extremities, Technic and General Papers.

The papers have been reprinted from current surgical journals, and it is therefore safe to assume that most surgeons have already formed their critical estimate of them. The contributions by Wilson on various pathological aspects of gastric carcinoma are more apt to have escaped surgical notice and they therefore call for special notice lest one miss their fundamental importance, for they represent a very high order of thoughtful, painstaking pathological research. Likewise the papers of Carman on X-ray diagnosis call for special mention, in so far as they illustrate the very highest type of correlated laboratory and operating room coöperation. The paper by Sheldon on Pleural Effusion adds very little to that which one finds in the ordinary textbooks; indeed, does not furnish data as satisfactory as that in Leube, Sahli, or Allbutt. The paper by Charles Mayo and Beckman on Visceral Pleurectomy would have been much more satisfying if more had been detailed regarding the purely technical side of the subject.

Naturally, it is impossible to pass in order from paper to paper. The variety of topics, if not bewildering, at least defies detailed critique within limited space. The important point to note is that, thanks to the excellent editing, this volume together with the previous ones, and those to come, constitute an invaluable and almost indispensable hand book of surgery.

THIS trilogy[1] by Morris is a purely literary product. The three volumes are not surgical, *sensu strictiori;* and yet we include a review of them for two very definite reasons. In the first place, a sort of guild-pride very properly prompts one surgeon to recognize a special order of merit in another surgeon. Dear old Doctor John Brown still reaps fame for having crystallized his "spare hours" into beautiful prose, and although Dr. Morris's essays hardly measure up with the "Horae Subsecivae" of Brown, they do possess that charm which almost always attends a spare hour labor of love. In the second place, the essays call for comment in that they illustrate what we have not yet referred to in our discussion of written English, namely, grace of style. Although it is true that the tremendous multiplicity of topics discussed and the unfortunately staccato method of discussion militates against that very smoothness of style which we admire in some of our other famous medical essayists, notably, the Browns, Weir Mitchel, Holmes and Osler, and although Dr. Morris himself modestly disclaims the power of literary expression, still there is an admirable virility of tone to much that Morris says, in his pleasing, colloquial fashion, even in spite of the very evident straining to express much of his matter aphoristically.

The titles of the three volumes are not representative except in the very broadest sense. One finds almost any conceivable subject discussed in any of the three volumes, irrespective of title. Indeed, one is at loss to know whether he more admires or wonders at the broad catholicity of taste and thought displayed in the fifteen hundred odd pages,— yes, they are good sized, full fledged books.

Whatever other purpose may be served by a surgical book review, it can hardly be used to clothe an argument of literary or philosophic dissent; so we must, perforce, seemingly agree with all that Dr. Morris says and simply pass him on to our various readers with the assurance that he will beguile their tedium. They will note, just as we have noted, a pleasing, inoffensive egoism, a fantastic tendency toward bizarre coinage (such as "carpender," "hobequs," "ovisness," and "damrotic"), a somewhat disturbing leaning toward hyperbole, and an ingrained love of out of doors that forces its way into the reader's consciousness as does the odor of new mown hay. Morris is at his very best when in the reminiscent mood of hunter or fisherman, or when expounding nut culture, or describing a scarlet tanager, or telling about the goslings, or Timmie and Dickie, the ducks.

Of course, the experiment of bombarding with three volumes all at once is dangerous for both Dr. Morris and his publishers. Involuntarily the wary reader shies at what he fears may be a literary purge. But believe us on faith, the books are decidedly worth while.

[1] TOMORROW'S TOPICS SERIES: MICROBES AND MEN. A SURGEON'S PHILOSOPHY. DOCTORS VERSUS FOLKS. By Robert T. Morris, M.D., Garden City, New York: Doubleday Page and Company, 1915.